AFWL-TR-69-114, Vol. I (Supp.)

USER'S MANUAL

Volume I

Boundary Layer Integral Matrix Procedure (BLIMP)

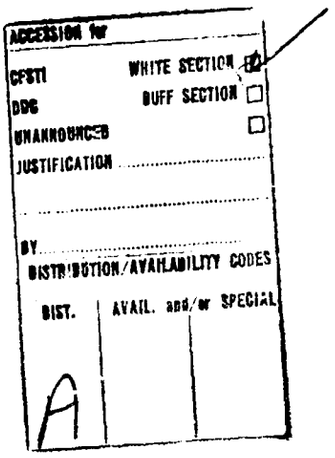
Larry W. Anderson Howard L. Morse

Aerotherm Corporation

TECHNICAL REPORT NO. AFWL-TR-69-114, Vol. I (Supp.)

October 1971

AIR FORCE WEAPONS LABORATORY
Air Force Systems Command
Kirtland Air Force Base
New Mexico



AIR FORCE WEAPONS LABORATORY
Air Force Systems Command
Kirtland Air Force Base
New Mexico 87117

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Larry W. Anderson
Howard L. Morse

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A supplement to the BLIMP computer program report is presented. Major new additions in the input section describe the data start procedure and the entropy layer option. For convenience, however, an entire new input section is included in this supplement. Also a new Fortran Variables List, a complete listing of the code, and two new check cases are included.

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FOREWORD

This report was prepared by the Aerotherm Corporation, Mountain View, California, under Contract F29601-70-C-0055. The research was performed under Program Element 62301F, Project 5791, Task 27.

Inclusive dates of research were May 1970 through March 1971. The report was submitted 1 September 1971 by the Air Force Weapons Laboratory Project Officer, Sergeant Dennis W. Lankford (SYT).

This technical report has been reviewed and is approved.

Dennis W. Lankford

DENNIS W. LANKFORD
Sergeant USAF
Project Officer

Jay R. Roland

JAY R. ROLAND
Major USAF
Chief, Theoretical Branch

Carl B. Hilland

CARL B. HILLAND
Lt Colonel USAF
Chief, Technology Division

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CONTENTS

SECTION I

INPUT

The revised input instructions are contained in this section.

GROUP 1 CONTROL CARD, TITLE, AND IDENTIFICATION (CALLED FROM RECASE)

CARD 1. FORMAT(20I1,19A4), KR

FIELD 1 (COLUMNS 1-20) THIS IS THE VARIABLE KR(DIMENSIONED 20) WHICH IS USED TO CONTROL THE VARIOUS PROGRAM OPTIONS

COLUMN 1 DETERMINES WHETHER A NEW SET OF ETA VALUES IS TO BE INPUT FOR PRESENT CASE (SEE GROUP 4)

0 USES RESIDENT VALUES FROM PREVIOUS CASE

1 VALUES INPUT BY USER (MANDATORY FOR FIRST CASE)

COLUMN 2 DESIGNATES TYPE OF FIRST GUESSES TO BE UTILIZED FOR PRIMARY VARIABLES (SEE GROUP 9)

0 USES BUILT-IN RELATIONS TO CALCULATE FIRST GUESSES (REQUIRES READING ONLY GUESS FOR ENTHALPY OF THE GAS AT THE WALL). RECOMMENDED FOR MOST SITUATIONS.

1 FIRST GUESSES INPUT BY USER

2 USES RESIDENT VALUES FROM PREVIOUS CASE (CANNOT BE USED FOR FIRST CASE OR WHEN COMPOSITION OF EDGE GAS IS DIFFERENT FROM PREVIOUS CASE)

3 FIRST GUESSES INPUT BY USER ARE ACCEPTED AS SOLUTION AT FIRST TIME AND FIRST OR SUBSEQUENT (FOR RESTART) STATION. USE THIS OPTION FOR DATA START AND RESTART (SEE GROUP 9).

COLUMN 3 DETERMINES TREATMENT OF STREAMWISE DERIVATIVES. SEE REFERENCE 1, SECTION III FOR EXPLANATION OF DIFFERENCE RELATIONS.

0 PERFORMS SIMILAR SOLUTION AT EACH STREAMWISE STATION

1 CONSIDERS TWO-POINT DIFFERENCE RELATIONS AT ALL STATIONS WITH THE FOLLOWING EXCEPTIONS (A SIMILAR SOLUTION IS PERFORMED AT THE FIRST STATION FOR NON-BLUNT BODIES AND AT THE FIRST TWO STATIONS FOR BLUNT BODIES)

2 CONSIDERS THREE POINT DIFFERENCE RELATIONS AT ALL STATIONS WITH THE FOLLOWING EXCEPTIONS (A SIMILAR SOLUTION IS PERFORMED AT THE FIRST STATION AND A TWO-POINT SOLUTION IS PERFORMED AT THE SECOND STATION FOR NON-BLUNT BODIES. SIMILAR SOLUTIONS ARE PERFORMED AT THE FIRST AND SECOND STATIONS AND A TWO-POINT SOLUTION IS PERFORMED AT THE THIRD STATION FOR BLUNT BODIES, AND A TWO-POINT SOLUTION IS PERFORMED FOR THE FIRST STATION AFTER A DISCONTINUITY - SEE CARD SET 4 OF GROUP 3).

COLUMN 4 DETERMINES WHEN OUTPUT BLOCK IS TO BE PRINTED

0 OUTPUT BLOCK PRINTED FOR CONVERGED SOLUTION OR FOR NONCONVERGED SOLUTION AFTER 50 ITERATIONS (WITH APPROPRIATE COMMENT)

1 OUTPUT BLOCK PRINTED AFTER EACH ITERATION

COLUMN 5 DETERMINES TREATMENT OF ENTROPY LAYER (SEE CARD SET 1 AND CARD 2 OF GROUP 15). KR(7) =0 OR 2 ONLY.

0 AN ISENTROPIC EXPANSION AROUND THE BODY IS PERFORMED (IN THE CASE OF A BLUNT BODY, THE ENTROPY CORRESPONDS TO THAT BEHIND A NORMAL SHOCK)

1 NOT USED

2 AXISYMMETRIC SHOCK LAYER

3 ENTROPY LAYER - INVISCID FLOW FIELD ENTROPY GRADIENTS ARE CONSIDERED (SEE GROUP 15)

4 ENTROPY AND ENERGY LAYER - BOTH INVISCID FLOW FIELD ENTROPY AND ENERGY GRADIENTS ARE CONSIDERED (SEE GROUP 15). NOT USED IN THIS VERSION

5 A NONISENTROPIC EXPANSION AROUND THE BODY IS PERFORMED, THE USER SUPPLYING ENTROPY CHANGES BETWEEN STREAMWISE STATIONS (THIS IS A ZEROTH APPROXIMATION TO AN ENTROPY LAYER. THE VELOCITY GRADIENT AT THE BOUNDARY LAYER EDGE BEING NEGLECTED)

COLUMN 6 DESIGNATES BODY SHAPE (IN THE CASE OF AXISYMMETRIC SHARP BODIES AND AXISYMMETRIC AND PLANAR BLUNT BODIES, A TRANSFORMATION OF STREAMWISE DISTANCE, S, TO S**3, S**4, AND S**2, RESPECTIVELY, IS UTILIZED TO PERFORM STREAMWISE INTEGRATIONS IN ORDER TO TAKE ADVANTAGE OF THE WAY THAT EDGE VELOCITY AND LOCAL BODY RADIUS VARY WITH S IN THE VICINITY OF THE TIP OR STAGNATION REGION. THEREFORE, A 4 OR 9 IN COL. 6 IS REQUIRED IF THE SOLUTION DOES NOT START FROM A SHARP TIP OR STAGNATION POINT. FURTHERMORE, IN THE CASE OF SHARP OR BLUNT BODIES, A DISCONTINUITY INTRODUCED AT A DOWNSTREAM STATION REVERTS TO INTEGRATION WITH RESPECT TO S STARTING AT THAT STATION. IT IS RECOMMENDED THAT THIS BE DONE AFTER AN APPRECIABLE CHANGE OF SURFACE INCLINATION WITH RESPECT TO THE FREE-STREAM VELOCITY FROM THAT AT THE TIP OR STAGNATION POINT. THE OPTIMUM SWITCH-OVER POINT DEPENDS ON THE SPECIFIC BODY SHAPE. IT IS LEFT TO THE USER TO ESTABLISH THIS FOR THE BODY SHAPE OF INTEREST. THE METHOD FOR IMPLEMENTING A DISCONTINUITY IS DISCUSSED UNDER CARD SET 4 OF GROUP 3).

0 AXISYMMETRIC BLUNT BODY

1 PLANAR BLUNT BODY

2 AXISYMMETRIC SHARP BODY

3 PLANAR SHARP BODY

4 AXISYMMETRIC SHAPE WHICH HAS NO BLUNT STAGNATION POINT. FOR EXAMPLE. A NOZZLE

5 AXISYMMETRIC BLUNT BODY WITH TRANSVERSE CURVATURE

6 . NOT USED

7 AXISYMMETRIC SHARP BODY WITH TRANSVERSE CURVATURE

8 AXISYMMETRIC SHAPE WITH INTERNAL FLOW AND TRANSVERSE CURVATURE

9 EXTERNAL FLOW OVER AXISYMMETRIC SHAPE WHICH HAS NO SHARP TIP OR BLUNT STAGNATION POINT AND WITH TRANSVERSE CURVATURE

COLUMN 7 DESIGNATES WHETHER OR NOT TURBULENT FLOW WILL BE CONSIDERED.

0 LAMINAR FLOW ONLY

1 NOT USED IN PRESENT VERSION OF PROGRAM

2 TURBULENT FLOW WILL BE COMPUTED IF TRANSITION CRITERIA IS EXCEEDED (SEE GROUP 8).

COLUMN 8 DESIGNATES FORM IN WHICH WALL MASS FLUXES ARE INPUT. (KR(8) IS NOT UTILIZED IF WALL FLUXES ARE NOT INPUT. THE FLUX NORMALIZING PARAMETER IS NOT GENERALLY KNOWN IN ADVANCE SO KR(8)=0 IS NORMALLY USED WHEN FLUXES ARE INPUT). UTILIZED IN CARD SETS 7 AND 11 IN GROUPS 16, 17, 18, ...

0 WALL FLUXES INPUT IN LBS/SEC FT**2

1 WALL FLUXES INPUT IN NORMALIZED FORM (I.E., DIVIDED BY -ALPHASTAR, SEE EQUATION 44 OF NASA CR-1062)

COLUMN 9 TOGETHER WITH COLUMN 11, THIS SPECIFIES THE TYPE OF WALL BOUNDARY CONDITIONS. THE USER IS URGED TO FAMILIARIZE HIMSELF WITH THE DISCUSSION IN APPENDIX I BEFORE CHOOSING THESE OPTIONS.

0 NOT GENERALLY USED. ASSIGNED ELEMENTAL MASS FRACTIONS AND STREAM FUNCTION AT THE WALL (REQUIRES KR(11) = 0 OR 1).

1 NOT GENERALLY USED. ASSIGNED ELEMENTAL MASS FRACTIONS AND TOTAL MASS FLUX AT THE WALL (REQUIRES KR(11) = 0 OR 1).

2 ASSIGNED COMPONENT MASS FLUXES AT THE WALL (MDOT EDGE GAS, MDOT PYROLYSIS GAS, MDOT CHAR-- REQUIRES KR(11) = 0, 1, OR 2).

3 NOT USED

4 WALL STEADY STATE ENERGY BALANCE WHILE SATISFYING WALL MASS BALANCES AND LIMITED SURFACE EQUILIBRIUM (USE KR(11) = 0, KR(7) = 0 OR 2.

COLUMN 10 DETERMINES TYPE OF CURVE FITS EMPLOYED TO REPRESENT THE PRIMARY VARIABLES OF VELOCITY RATIO, TOTAL ENTHALPY, AND ELEMENTAL MASS FRACTIONS (KR(10)=0 IS RECOMMENDED FOR ACCURACY FOR MOST PROBLEMS, HOWEVER, KR(10)=1 IS BETTER FOR SEVERE PROBLEMS (E.G., NEARLY BLOWN OFF BOUNDARY LAYERS) FOR WHICH CUBICS CAN BECOME POORLY BEHAVED)

0 UTILIZES CONNECTED CUBICS

1 UTILIZES CONNECTED QUADRATICS EXCEPT FOR OUTERMOST SEGMENT WHERE CONNECTED CUBICS ARE EMPLOYED

2 UTILIZES CONNECTED QUADRATICS EVERYWHERE.

COLUMN 11 TOGETHER WITH COLUMN 9, THIS DESIGNATES THE TYPE OF WALL BOUNDARY CONDITION (SEE APPENDIX I). SEE GROUPS 16, 17, 18,...

0 ASSIGNED WALL TEMPERATURE. ALSO USED WITH KR(9)=4. THIS OPTION TOGETHER WITH KR(9)=2 WILL YIELD SURFACE EQUILIBRIUM OR KINETIC SURFACE SOLUTION IF THE ASSIGNED TEMPERATURE IS GREATER THAN THE ASSIGNED ABLATION TEMPERATURE (SEE GROUP 11, CARD 1, FIELD 7). THE PROGRAM WILL CALCULATE THE APPROPRIATE CHAR FLUX. ASSIGNED CHAR FLUX SHOULD BE SET TO ZERO (SEE GROUP 16, CARD SET 11).

1 ASSIGNED WALL ENTHALPY.

2 SURFACE EQUILIBRIUM WITH ASSIGNED COMPONENT MASS FLUXES (REQUIRES KR(9) = 2). THE PROBLEM IS WELL-POSED AND WILL CONVERGE ONLY IF THERE EXISTS A TEMPERATURE ABOVE 250K GIVING SURFACE EQUILIBRIUM FOR THE ASSIGNED COMPONENT MASS FLUXES. USE WITH CAUTION FOR ANALYSES OF MATERIALS WITH PLATEAU-LIKE BEHAVIOR.

3 CABLE SOLUTIONS ONLY. ASSIGNED WALL TEMPERATURE.

4 CABLE SOLUTIONS ONLY. SURFACE EQUILIBRIUM.

COLUMN 12 DETERMINES WHETHER OR NOT NEW DATA FOR THERMODYNAMIC AND TRANSPORT PROPERTIES ARE TO BE USED AND WHETHER OR NOT SURFACE KINETIC DATA ARE TO BE CONSIDERED (SEE GROUPS 11, 12, 13, AND 14). APPLIES ONLY FOR KR(7)=0 OR 2. (KR(12) MUST BE 0, 2, 5, OR 7 FOR FIRST CASE). IN THE FOLLOWING, X=5 FOR KINETIC DATA AND X=0 FOR NO KINETIC DATA.

X USER INPUTS NEW DATA FOR ELEMENTS AND MOLECULAR, ATOMIC, AND IONIC SPECIES. THERMOCHEMICAL DATA NOT PRINTED IN OUTPUT.

1+X USES RESIDENT ELEMENTAL AND SPECIES DATA.

2+X SAME AS KR(12)=X EXCEPT THERMOCHEMICAL DATA ARE PRINTED IN OUTPUT. (WHEN X=5 KINETIC DATA ALWAYS PRINTED IN OUTPUT).

COLUMN 13 PERMITS THE ASSIGNMENT OF A CONVERGENCE DAMPING FACTOR (THIS IS OVERRIDDEN IF A SMALLER DAMPING FACTOR IS COMPUTED INTERNALLY BY SOME CONSTRAINT)

0 NO DAMPING FACTOR IS ASSIGNED

J IF J IS GREATER THAN ZERO, CORRECTIONS ARE DAMPED UNIFORMLY BY J/10 THIS PROCEDURE IS NOT RECOMMENDED AS IT IS VERY INEFFICIENT AND THE DAMPING COMPUTED BY THE PROGRAM IS USUALLY ADEQUATE

COLUMN 14 DETERMINES MODEL TO BE EMPLOYED FOR MULTICOMPONENT TRANSPORT PROPERTIES. APPLIES ONLY FOR KR(7) = 0 OR 2. CONSIDERING UNEQUAL DIFFUSION COEFFICIENTS CAN SUBSTANTIALLY INCREASE THE NUMBER OF ITERATIONS (AND SOMETIMES CONVERGENCE DOES NOT OCCUR IN THE ALLOWED NUMBER OF ITERATIONS) DUE TO THE USE OF INEXACT DERIVATIVES IN THE NEWTON-RAPHSON ITERATION PROCEDURE

0 CONSIDERS UNEQUAL DIFFUSION AND THERMAL DIFFUSION COEFFICIENTS FOR ALL SPECIES

1 CONSIDERS UNEQUAL DIFFUSION COEFFICIENTS FOR ALL SPECIES BUT NEGLECTS THERMAL DIFFUSION

2 CONSIDERS EQUAL DIFFUSION COEFFICIENTS AND NEGLECTS THERMAL DIFFUSION

COLUMN 15 NON-ZERO ENTRY PROVIDES DEBUG OUTPUT FOR FIRST GUESSES AND LINEAR MATRICES (SEE DEBUG INSTRUCTIONS FOR MORE DETAILED INFORMATION ON COLUMNS 15 THROUGH 20)

0 NO DEBUG

1 FIRST GUESSES ARE DUMPED

2 LINEAR MATRICES BEFORE AND AFTER INVERSION ARE ALSO DUMPED

COLUMN 16 NON-ZERO ENTRY PROVIDES DEBUG OUTPUT FOR WALL FLUXES AND SURFACE EQUILIBRIUM ITERATION (SOME OF THE TESTS ARE ACTUALLY MADE ON KR(7). SEE DEBUG INSTRUCTIONS)

0 NO DEBUG

X FOR X GREATER THAN ZERO, THE DERIVATIVES OF WALL ENERGY AND MASS FLUXES WITH RESPECT TO REDUCED NONLINEAR VARIABLES (DQJRNL), AND THE ASSOCIATED ERRORS (WALLQJ AND DELQJW) ARE DUMPED. ALSO, THE MATRIX OF WALL RELATIONS BEFORE AND AFTER MATRIX INVERSION IS DUMPED FOR KP(11)=2 PROBLEMS.

Y FOR Y GREATER THAN UNITY, SURFACE EQUILIBRIUM ITERATION INFORMATION IS ALSO DUMPED (AS IN KR(18)) AND IF KR(17) IS GREATER THAN ZERO, THE DERIVATIVES OF WALL ENERGY AND MASS FLUXES WITH RESPECT TO ALL NONLINEAR VARIABLES (DQJNL) ARE ALSO DUMPED.

COLUMN 17 NON-ZERO ENTRY PROVIDES DEBUG OUTPUT FOR COEFFICIENTS IN NON-LINEAR EQUATIONS AND FOR STREAMWISE DERIVATIVES

0 NO DEBUG

X FOR X GREATER THAN ZERO, STREAMWISE DERIVATIVE INFORMATION IS DUMPED.

Y FOR (Y+1-ITS) GREATER THAN ZERO, WHERE ITS IS THE NUMBER OF THE CURRENT BOUNDARY LAYER ITERATION, THE COEFFICIENTS WHICH COMBINE TO MAKE UP THE NONLINEAR EQUATIONS (COEEQV ARRAY) AND CERTAIN LINEAR AND NONLINEAR ERROR INFORMATION ARE DUMPED AND THE DERIVATIVES OF THE NONLINEAR EQUATIONS WITH RESPECT TO THE NONLINEAR VARIABLES (AM ARRAY) ARE DUMPED BEFORE AND AFTER INVERSION.

COLUMN 18 NON-ZERO ENTRY PROVIDES DEBUG OUTPUT FOR CHEMISTRY ITERATION (KR(7) = 0 OR 2 ONLY). (THE TESTS ARE ACTUALLY MADE ON KR(7). SEE DEBUG INSTRUCTIONS).

0 NO DEBUG

1 DUMPS CHEMISTRY ITERATIONS IN DETAIL FOR ITS GREATER THAN 45 WHERE ITS IS THE COUNTER ON CHEMISTRY ITERATIONS

2 DUMPS ONE LINE PER ITERATION DURING EACH CHEMISTRY ITERATION

Y FOR Y OF 3 THROUGH 6, DUMPS CHEMISTRY ITERATIONS IN DETAIL WHEN (5*(Y-2)-ITS) IS GREATER THAN ZERO.

X FOR X OF 7 THROUGH 9, DUMPS CHEMISTRY ITERATIONS IN DETAIL WHEN ITS IS GREATER THAN 10X-50.

COLUMN 19 NON-ZERO ENTRY PROVIDES DEBUG OUTPUT FOR LINEAR AND NONLINEAR ERRORS

0 NO DEBUG

1 DUMPS (FOR EACH ITERATION) THE FOLLOWING. ERRORS FOR NONLINEAR

COLUMN 20 NON-ZERO ENTRY PROVIDES DEBUG OUTPUT FOR THERMODYNAMIC AND TRANSPORT PROPERTIES (KR(7) = 0 OR 2 ONLY).

0 NO DEBUG

X FOR X GREATER THAN ZERO, GIVES THERMODYNAMIC AND TRANSPORT PROPERTY INFORMATION FOR EACH CHEMISTRY SOLUTION

2 GIVES MATRIX OF PROPERTY DERIVATIVES BEFORE AND AFTER INVERSION

FIELD 2 (COLUMNS 21-80). CASE

TITLE OF CASE (ALPHANUMERIC). USED FOR IDENTIFICATION OF PRINTED OUTPUT)

CARD 2

INSERT A BLANK CARD HERE

GROUP 2 NUMBER OF ELEMENTS (CALLED FROM RECASE)

CARD 1. FORMAT(I2,8X,40I1)

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), NSP

NUMBER OF ELEMENTS IN THE SYSTEM NOT INCLUDING ELECTRONS (MAX. OF 9)

FIELDS 2-51 (COLUMNS (11-60), KS(M), M=1,NS ***** USED ONLY FOR KR(9) OR ANY OF THE KR9 = 2 OR 4 *****

THE SURFACE MATERIAL IS SPECIFIED IN ADVANCE BY THE USER FOR KR(9) = 3 OR 4. UP TO THREE MATERIAL COMBINATIONS ARE ALLOWED. EACH COMBINATION MAY HAVE A SEPARATE PYROLYSIS GAS AND CHAR MATERIAL SPECIFIED IN GROUP 11, FIELD 5. ENTER A 1, 2, OR 3 TO DENOTE MATERIAL COMBINATION 1, 2, OR 3 STARTING WITH THE STATION 1 ENTRY IN COLUMN 11, STATION 2 IN COLUMN 12, ETC. SEE ALSO GROUP 6, CARDS 1 AND 2.

GROUP 3 TIMES AND STATIONS (CALLED FROM RECASE)

CARD 1. FORMAT(I2)

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), NITEM

NUMBER OF TIMES (OR SUBCASES) BEING CONSIDERED IN PRESENT CASE. (MAXIMUM OF 50). A SERIES OF PROBLEMS CAN BE CONSIDERED AS A SEQUENCE OF TIMES (OR SUBCASES) IN THE SAME CASE AS LONG AS THE FOLLOWING ARE UNCHANGED, NUMBER OF ELEMENTS (GROUP 2), STREAMWISE STATIONS (CARD 3 AND CARD SET 4 OF THIS GROUP), NODAL SPACING (GROUP 4), BODY SHAPE (GROUP 5), AND ELEMENTAL AND SPECIES DATA (GROUP 10 OR 11 THRU 14) (AND THUS EDGE GAS AND WALL MATERIAL). CALCULATIONS ARE PERFORMED FOR ALL TIMES AT A GIVEN STATION BEFORE PROCEEDING TO NEXT STATION AND THUS APPEAR IN THIS ORDER IN THE PRINTED AND PUNCHED CARD OUTPUT.

CARD SET 2. FORMAT(8F10.4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD, TIME(M), M=1,NITEM (SEE CARD 1 OF THIS GROUP)

TIME, SEC. THIS VARIABLE SERVES ONLY TO IDENTIFY SOLUTIONS SINCE TIME DOES NOT ENTER INTO THE SOLUTION OF THE PROBLEM. USE A NEGATIVE ENTRY FOR TIME(1) IF IT IS DESIRED THAT THESE IDENTIFICATION NUMBERS BE CALLED CASES IN THE OUTPUT FORMAT (OTHERWISE, THEY ARE IDENTIFIED AS TIMES).

CARD 3. FORMAT(I2,8X,40I1)

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), NS

NUMBER OF STREAMWISE STATIONS (MAXIMUM OF 40)

FIELD 2 (COLUMNS 11-50), KR9

VALUES TO BE ASSIGNED TO KR(9) WHEN WALL BOUNDARY CONDITIONS ARE TO BE CHANGED AT DOWNSTREAM STATIONS (SEE CARD 1 OF GROUP 1). COLUMN 11 CORRESPONDS TO STATION S(1), COLUMN 12 TO STATION S(2), AND SO ON. IF WALL BOUNDARY CONDITIONS ARE NOT TO BE CHANGED AT DOWNSTREAM STATIONS, THIS FIELD SHOULD BE LEFT BLANK. WHEN THE KR9( ) ARE EMPLOYED, KR(9) SHOULD BE GIVEN THE VALUE NECESSARY TO READ ALL APPROPRIATE WALL DATA (GROUP 16). AT THE PRESENT TIME, IT IS POSSIBLE TO CONSIDER ANY COMBINATIONS KR9 OF 2, 3, AND 4 COMPRISING REGIONS OF AN ABLATION MATERIAL AND REGIONS WHERE THERE IS NO ABLATION (THESE NON-ABLATING REGIONS ARE OBTAINED BY USE OF KR9( ) = 2 WHILE ASSIGNING ZERO COMPONENT MASS FLUXES, SEE CARD SET 11 OF GROUP 16)

CARD SET 4. FORMAT(8E10.4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD, S(L), I=1,NS (SEE CARD 3 OF THIS GROUP)

STREAMWISE DISTANCE UPON WHICH BOUNDARY-LAYER SOLUTION IS BASED, FEET. A BLUNT-BODY PROBLEM (KR(6) = 0,1 OR 5) SHOULD START WITH AN S(1) OF 0. A SHARP-BODY PROBLEM (KR(6) = 2,3 OR 7) OR A NOZZLE-TYPE PROBLEM (KR(6)= 4 OR 8) MUST NOT START WITH A S(1) OF 0, BUT MUST START WITH SOME FINITE DISTANCE. THE BOUNDARY LAYER IS ASSUMED TO BE SIMILAR UP TO AND INCLUDING THIS FIRST STATION. A NEGATIVE ENTRY FOR S(L) SIGNIFIES A DISCONTINUITY AT THAT STATION. THIS PRODUCES A TWO-POINT DIFFERENCE SOLUTION AT THE FIRST STATION AFTER THE DISCONTINUITY AND THUS HAS AN EFFECT ONLY FOR THREE-POINT SOLUTIONS (KR(3)=2). ALSO, FOR BLUNT BODIES, A MINUS SIGN AT A STATION CAUSES STREAMWISE INTEGRATIONS TO REVERT TO S AS THE INDEPENDENT VARIABLE - SEE DISCUSSION UNDER CARD 1, COLUMN 6 OF GROUP 1. FOR DATA START OPTION (SEE GROUP 9) IT IS SUGGESTED THAT THE SECOND STATION BE 0.01 FEET DOWNSTREAM OF THE FIRST AND THE THIRD, ABOUT 0.05 FEET DOWNSTREAM.

GROUP 4 NODAL DATA (CALLED FROM RECASE) *** SKIP THIS GROUP FOR KR(1)=0 ***

CARD 1. FORMAT(I2) ***** USED ONLY IF KR(1)=1 *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), NETA

NUMBER OF NODAL POINTS ACROSS THE BOUNDARY LAYER INCLUDING WALL AND BOUNDARY LAYER EDGE (MAXIMUM OF 15).

CARD SET 2. FORMAT(8E10.4) ***** USED ONLY IF KR(1)=1 *****

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD, ETA(I), I=1,NETA (SEE CARD 1 OF THIS GROUP)

ETA STATIONS ACROSS THE BOUNDARY LAYER, STARTING AT THE WALL (ETA = 0.0). NOTE THAT THESE ARE ACTUALLY η VALUES, AS DEFINED BY EQUATION NO. 33, NASA CR 1062. OTHER REFERENCES TO ETA IN THE INPUT SECTION OF THIS MANUAL ALSO REFER TO η. IT IS RECOMMENDED THAT THE VALUE OF ETA AT THE BOUNDARY-LAYER EDGE BE GIVEN A VALUE OF ABOUT 5.0 SO THAT THE STRETCHING PARAMETER WILL BE NEAR UNITY. ALSO, THERE SHOULD NOT BE MUCH MORE THAN A TWO-FOLD CHANGE IN DISTANCE BETWEEN TWO NEIGHBORING NODES. BEST ACCURACY FOR A GIVEN NUMBER OF NODES IS OBTAINED IF THE NODES ARE CLOSER TOGETHER NEAR THE WALL. FOR LAMINAR PROBLEMS, 7 NODES ARE OFTEN SUFFICIENT WITH A TYPICAL SPACING BEING 0.0, 0.5, 1.0, 1.5, 2.0, 3.0, 5.0 AND WITH KAPPA = 5, CHAR = 0.8 (SEE CARD 3, FIELDS 1 AND 2 OF THIS GROUP). FOR TURBULENT BOUNDARY LAYERS, MORE NODES ARE NEEDED CLOSE TO THE WALL DUE TO THE STEEP GRADIENTS THERE. A TYPICAL SPACING WOULD BE 0.0, 0.024, 0.040, 0.072, 0.120, 0.200, 0.320, 0.480, 0.800, 1.400, 2.000, 3.200, 5.000, WITH KAPPA = 11 AND CHAR = 0.95. WHATEVER THE NODE SPACING THE

USER MUST EXAMINE THE SOLUTIONS TO BE SURE THAT A REASONABLE CURVEFIT IS OBTAINED NEAR THE WALL. THIS CAN BE A PROBLEM FOR LARGE STREAMWISE DISTANCES IN TURBULENT FLOWS. IN CHECKING THE RESULTS, FOR TURBULENT BOUNDARY LAYERS, THE DIMENSIONLESS EDDY VISCOSITY SHOULD BE LESS THAN 0.05 (RHOSQ*EPS/RHOE*MUE IN THE OUTPUT) FOR THE SECOND ETA NODE TO INSURE GOOD WALL CURVEFITS. OPTIMUM MODELING OF THE TRANSITION REGION OF THE PROFILE REQUIRES SUFFICIENT ETA SPACING BETWEEN THE VISCOSITY RATIO VALUES OF 0.1 TO 10. IT IS SUGGESTED THIS INTERVAL CONTAIN AT LEAST SEVEN NODES.

CARD 3. FORMAT(I2,E10.4) ***** USED ONLY IF KR(1)=1 *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED). KAPPA

THE VARIABLE KAPPA IS ASSOCIATED WITH THE CONSTRAINT WHICH IS UTILIZED TO EFFECT A STRETCHING OF ETA, THE BOUNDARY-LAYER COORDINATE NORMAL TO THE SURFACE, IN ORDER TO EFFECTIVELY USE THE ASSIGNED NODAL SPACING (SEE CARDS 1 AND 2 OF THIS GROUP). KAPPA IS THE INDEX FOR THE NODAL POINT AT WHICH THE VELOCITY RATIO IS FIXED. TO ILLUSTRATE, IF KAPPA IS 5, THEN THE FIFTH NODAL POINT COUNTING FROM THE WALL AND INCLUDING THE WALL WILL HAVE A VALUE OF CRAR (A QUANTITY WHICH IS INPUT IN THE SECOND FIELD OF THIS CARD).

FIELD 2 (COLUMNS 3-12). CRAR

CRAR IS THE VALUE OF THE VELOCITY RATIO AT THE BOUNDARY-LAYER NODE DESIGNATED KAPPA (SEE DISCUSSION UNDER FIELD 1 OF THIS CARD). FOR EDGE VORTICITY, THE VELOCITY AT KAPPA IS RATIOD TO THE LINEAR EXTRAPOLATION OF THE EDGE VELOCITY TO THE KAPPA NODE.

GROUP 5 BODY SHAPE DATA (CALLED FROM RECASE)

CARD 1. FORMAT(2E10.4) ***** USED ONLY IF BLUNT BODY, KR(6)=0.1, OR 5 *****

FIELD 1 (COLUMNS 1-10). CONE

CONE HALF-ANGLE IN SPHERE-CONE SHAPE BODIES, LEAVE BLANK FOR OTHER BODY SHAPES.

FIELD 2 (COLUMNS 11-20). RNOSE

EFFECTIVE NOSE RADIUS, FEET. THE VALUE READ INTO THIS FIELD IS OVERRIDDEN IF THE PRESSURE RATIO AT THE FIRST STATION, PRE(1), IS READ IN AS A ZERO (SEE CARD SET 3 OF GROUP 15). IF PRE(1) IS NON-ZERO, THEN A NON-ZERO ENTRY IN THE CURRENT FIELD IS USED IN THE CALCULATION OF STAGNATION POINT VELOCITY GRADIENT FROM THE NEWTONIAN RELATION

DUES = SQRT(2./RHOE * PE * 32.1740 * 2116.) / RNOSE

WHERE DUES IS THE STAGNATION POINT VELOCITY GRADIENT AND RHOE AND PE ARE LOCAL STAGNATION DENSITY (LB/FT3) AND PRESSURE (ATM), RESPECTIVELY. THIS LATTER APPROACH IS REQUIRED FOR BLUNT-BODY PROBLEMS IF THERE IS ONLY ONE STATION (NS = 1, SEE CARD 3 OF GROUP 3). WHEN RNOSE IS READ INTO THE CURRENT FIELD AND NOT BEING OVERRIDDEN (I.E., WHEN PRE(1) IS NOT SET EQUAL TO ZERO) A MACH NUMBER CORRECTION (IMPORTANT FOR LOW FREE-STREAM MACH NUMBERS) CAN BE MADE BY INPUTTING

RNOSE = REFF / SQRT(1. - PINF / PE)

WHERE REFF IS THE TRUE EFFECTIVE NOSE RADIUS (FEET) AND PINF IS THE FREE STREAM STATIC PRESSURE (LB/FT2). (IF THE CURRENT FIELD IS LEFT BLANK AND PRE(1) IS NON-ZERO, THE STAGNATION-POINT VELOCITY GRADIENT IS COMPUTED FROM A CURVE FIT OF THE PRE AROUND THE BODY. IN ANY EVENT, A CURVE FIT OF PRESSURE IS USED TO COMPUTE VELOCITY GRADIENT FOR STATIONS 2 AND BEYOND).

CARD SET 2, FORMAT(8F10.4) ***** NOT USED IF KR(6)=1 OR 3 *****

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD, ROKAP(L), L=1, NS (SEE CARD 3 OF GROUP 3)

THIS IS THE LOCAL BODY RADIUS IN FEET NORMAL TO THE BODY CENTERLINE RAISED TO THE KAPPA POWER WHERE KAPPA IS UNITY FOR AXISYMMETRIC BODIES AND ZERO FOR PLANAR BODIES. THEREFORE, ROKAP IS UNITY FOR PLANAR BODIES AND LOCAL BODY RADIUS FOR AXISYMMETRIC BODIES. TWO SPECIAL INPUT FORMATS CAN BE USED. FOR SPHERE CONE BODIES, SET ROKAP(1) EQUAL TO MINUS THE NOSE RADIUS. THE NOSE RADIUS IS THEN SET TO - ROKAP(1) AND ROKAP(1) IS SET TO ZERO. IF SUBSEQUENT ROKAP( ) ARE INPUT AS ZEROES, THE PROGRAM COMPUTES ROKAP FROM S FOR A SPHERICAL NOSE. THE FIRST NON-ZERO ENTRY IS THE ROKAP AT THE CONE TANGENT POINT. IF THIS IS AGAIN FOLLOWED BY ZEROES, LINEAR INTERPOLATION IS USED TO THE NEXT NONZERO ENTRY TO YIELD ROKAP ALONG A CONICAL AFTERBODY.

FOR SHARP CONES, KR(6) = 2 OR 7, SET ROKAP(1) EQUAL TO MINUS THE CONE HALF ANGLE IN DEGREES. ROKAP(1) IS THEN SET TO ZERO AND THE PROGRAM COMPUTES ROKAP FROM S FOR A SHARP CONE OF THE SPECIFIED HALF ANGLE.

GROUP 6 MATERIAL PROPERTY DATA NEEDED FOR SMALL QUASI-STEADY ENERGY BALANCE (CALLED FROM RECASE) *****CONSIDER THIS GROUP ONLY IF KR(9) OR ANY OF THE KR9 IS EQUAL TO 3 OR GREATER*****

CARD 1. FORMAT(9F8.3) ** USED ONLY IF KR(9) OR ANY OF THE KR9 IS 3 OR 4 **

FIELDS 1,4,7 (COLUMNS 1-8, 25-32, 49-56), EMIV(I),I=1,3

SURFACE EMITTANCE OF THE MATERIAL COMBINATIONS BEING CONSIDERED UNDER KR(9) OR KR9 OF 3 OR 4.

FIELDS 2,5,8 (COLUMNS 9-16, 33-40, 57-64), HCARB(I),I=1,3

HEAT OF FORMATION (BTU/LB) OF THE VIRGIN STATE OF THE ABLATION MATERIALS BEING CONSIDERED UNDER KR(9) OR KR9 OF 3 OR 4.

FIELDS 3,6,9 (COLUMNS 17-24, 41-48, 65-72), HPG(I),I=1,3

HEAT OF FORMATION (BTU/LB) OF THE TRANSPIRANTS BEING CONSIDERED UNDER KR(9) OR KR9 OF 3 OR 4.

CARD 2. FORMAT(6A4) ** USED ONLY WITH CARD 1 **

FIELDS 1,2, AND 3 (COLUMNS 1-8, 9-16, 17-24)

NAMES OF SURFACE SPECIES FOR MATERIAL COMBINATIONS 1,2, AND 3 EXACTLY AS THEY APPEAR IN THE THERMODYNAMIC DATA TABLES (GROUP 13), LEFT JUSTIFIED.

GROUP 7 FUNCTION-OF-TIME DATA (CALLED FROM RECASE)

CARD SET 1. FORMAT(8E10.4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD. PTET( ), N=1,NITEM (SEE CARD 1 OF GROUP 3)

LOCAL STAGNATION PRESSURE FOR EACH TIME BEING CONSIDERED, ATMOSPHERES

CARD SET 2. FORMAT(8E10.4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD.
HE(M), M=1,NITEM (SEE CARD 1 OF GROUP 3)

STAGNATION ENTHALPY FOR EACH TIME BEING CONSIDERED. BTU/LB

CARD SET 3. FORMAT(8F10.4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD.
RADFL(M), M=1,NITEM (SEE CARD 1 OF GROUP 3)

INCIDENT RADIATION FLUX ABSORBED BY THE SURFACE AT STATION S(1) FOR EACH TIME BEING CONSIDERED. BTU/SEC FT2 (IF A SURFACE ABSORPTIVITY LESS THAN UNITY IS TO BE CONSIDERED, THESE ENTRIES SHOULD BE CORRECTED FOR SURFACE ABSORPTIVITY). THIS INFORMATION IS USED ONLY FOR KR(9) OR KR9 OF 4 OR 6. INPUT BLANKS IN THIS FIELD FOR OTHER TYPES OF PROBLEMS. RADIATION FLUX AT OTHER STATIONS WILL BE INPUT AS RATIOS IN GROUP 15.

GROUP 8 TURBULENT FLOW PARAMETERS (CALLED FROM TREMBL) **** CONSIDER THIS GROUP ONLY IF KR(7)=2 OR 3 ****

CARD 1. FORMAT(6E10.3)

FIELDS 1-6. (COLUMNS 1-10, 11-20, 21-30, 31-40, 41-50, 51-60) ELCON, YAP, CLNUM, SCT, PRT, RETR

ELCON IS THE PRANDTL MIXING LENGTH CONSTANT (0.44 IS A TYPICAL VALUE).

YAP IS A CONSTANT OF PROPORTIONALITY IN THE MIXING LENGTH EXPRESSION (1.823 IS A TYPICAL VALUE).

CLNUM IS THE CLAUSER CONSTANT OF PROPORTIONALITY IN WAKE REGION (0.018 IS A TYPICAL VALUE).

SCT IS THE TURBULENT SCHMIDT NUMBER.

PRT IS THE TURBULENT PRANDTL NUMBER.

RETR IS THE TRANSITION REYNOLDS NUMBER BASED ON MOMENTUM THICKNESS. IF RETR IS EXCEEDED, TURBULENCE TERMS WILL BE INCLUDED IN THE GOVERNING EQUATIONS.

GROUP 9 FIRST GUESS OR RESTART INFORMATION (CALLED FROM FIRSTG) **** SKIP THIS GROUP FOR KR(2)=2. CONSIDER ONLY CARD 6 FOR KR(2)=0 ****

CARD 1. FORMAT(3E10.4,5X,I5) **** USED ONLY FOR KR(2)=1 OR 3 ****

FIELD 1 (COLUMN 1-10) ALPH (NON-DIMENSIONAL)

FIRST GUESS, RESTART, OR DATA START (INPUT OF A MEASURED PROFILE) VALUE FOR THE BOUNDARY LAYER NORMALIZING PARAMETER, ALPHA. FOR A DATA START, THE VALUE OF ALPHA MUST BE CONSISTENT WITH THE INPUTS IN FIELDS 2 AND 3 OF THIS CARD AND OF CARD 3 OF THIS GROUP. MAY BE CALCULATED FROM EQUATION 61 OF REFERENCE 1.

FIELD 2 (COLUMNS 11-20) F(1,1) (NON-DIMENSIONAL)

FIRST GUESS, RESTART, OR DATA START VALUE FOR THE STREAM FUNCTION AT THE WALL. THE VALUE OF THIS PARAMETER MUST BE EQUAL TO THE VALUE OF EQUATION 63 OF REFERENCE 1 ASSUMING A CONSTANT INTEGRAND WITH ALL QUANTITIES EVALUATED AT THE INPUT STATION. THE VALUE OF THE INTEGRATION VARIABLE, XI, IS FOUND IN EQUATION 61 OF REFERENCE 1 BY AGAIN SETTING THE INTEGRAND CONSTANT AT THE VALUE OF THE INPUT STATION WITH THE INTEGRATION VARIABLE, S, SET EQUAL TO THE FIRST ASSIGNED STREAMWISE DISTANCE (SEE CARD SET 4 OF GROUP 3). THE ABOVE PROCEDURE IS ESSENTIAL BECAUSE BLIMP CALCULATES THESE QUANTITIES AT THE FIRST STATION ASSUMING THAT ALL UPSTREAM QUANTITIES ARE CONSTANT AND EQUAL TO THE ASSIGNED VALUES AT THE FIRST STATION: TO INPUT VALUES OF ALPH, AND F(1,1) INCONSISTENT WITH THESE VALUES MAY RESULT IN NON-CONVERGENCE AT THE SECOND STREAMWISE STATION.

FIELD 3 (COLUMNS 21-30) F(3,1) (NON-DIMENSIONAL)

FIRST GUESS, RESTART, OR DATA START VALUE FOR NORMALIZED VELOCITY GRADIENT AT THE WALL. THE CORRECT FORM OF THIS TERM IS

$$\left.\frac{\partial (u/u_e)}{\partial \eta}\right|_{wall}$$

THIS IS EQUIVALENT TO

$$\left.\frac{1}{a_H}\,\frac{\partial (u/u_e)}{\partial \bar{\eta}}\right|_{wall}$$

WHERE $\bar{\eta}$ IS DEFINED BY EQUATION 33 OF NASA CR-1061. FOR RESTART PURPOSES, THE FPP NUMERICAL VALUE PRINTED OUT BY BLIMP AT THE WALL NODE IS CORRECT. THE BLIMP FP- G, AND ELEMENTAL MASS FRACTION OUTPUT IS ALSO IN THE CORRECT FORM FOR INPUT IN CARD SETS 2, 3, AND 4.

FIELD 4 (COLUMN 36-40, RIGHT JUSTIFIED) IST

STATION NUMBER FOR RESTART. MEANINGFUL ONLY FOR KR(2)=3.

CARD SET 2. FORMAT(8F10.4) **** USED ONLY FOR KR(2)=1 OR 3 ****

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD.
F(2,I), I=1,NETA.

FIRST GUESSES, RESTART, OR DATA START VALUES FOR VELOCITY RATIO F(2,I) ACROSS THE BOUNDARY LAYER. THE VALUES MUST BE CONSISTENT WITH THE INPUT ETA DISTRIBUTION OF GROUP 4. THAT IS, THEY MUST BE RELATED TO THE ETA DISTRIBUTION BY A CURVE FIT PROCEDURE IDENTICAL TO THAT SPECIFIED BY KR(1) IN GROUP 1.

CARD SET 3. FORMAT(8F10.4) **** USED ONLY FOR KR(2)=1 OR 3 ****

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD.
G(2,1), G(1,I), I=1,NETA

FIRST GUESSES, RESTART, OR DATA START VALUES FOR THE TOTAL ENTHALPY GRADIENT AT THE WALL DIVIDED BY ALPH (G(2,1)) AND THE TOTAL ENTHALPY G(1,I) ACROSS THE BOUNDARY LAYER.

CARD SET 4. FORMAT(8F10.4) **** USED ONLY FOR KR(2)=1 OR 3 AND NSP GREATER THAN 1 ****

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD.
(SP(2,1,K), SP(1,1,K), I=1,NETA) K=1, NSP-1

FIRST GUESSES, RESTART, OR DATA START VALUES FOR ELEMENTAL MASS FRACTION GRADIENT AT THE WALL SP(2,1,K) AND ELEMENTAL MASS FRACTION VALUES SP(1,I,K) ACROSS THE BOUNDARY LAYER. READ IN WALL GRADIENT AND VALUES AT NODES FOR EACH SPECIES BEFORE GOING ON TO NEXT SPECIES. START EACH SPECIES ON A NEW CARD.

CARD SET 5. FORMAT(40I2) **** USED ONLY FOR KR(2)=1 OR 3 AND NSP GREATER THAN 1 ****

FIELD 1 (COLUMNS 1-2, RIGHT JUSTIFIED), FIELD 2 (COLUMNS 3-4, RIGHT JUSTIFIED), ETC., (LEF(K), K=1,NSP) (SEE CARD 1 OF GROUP 2)

ENTRIES IN THESE FIELDS MUST INDIVIDUALLY CORRESPOND TO THE ELEMENTS AS THEY ARE SELECTED FROM THE THERMODYNAMIC DATA (SEE DISCUSSION UNDER GROUP 13) ACCORDING TO WHETHER, FOR THE FIRST STATION, THE ELEMENT IS

0 NOT PRESENT

1 PRESENT DUE TO LOCAL INJECTION

2 PRESENT DUE TO UPSTREAM INJECTION (NOT POSSIBLE AT FIRST STATION)

3 PRESENT FROM THE EDGE GAS

CARD 6. FORMAT(F10.4) ***** USED ONLY FOR KR(2)=0 *****

FIELD 1 (COLUMNS 1-10). GW

FIRST GUESS FOR ENTHALPY OF THE GAS AT THE WALL, BTU/LB

GROUP 10 THIS CARD GROUP NOT USED IN THE PRESENT VERSION OF THE PROGRAM

GROUP 11 ELEMENTAL DATA (CALLED FROM INPUT)
**** SKIP THIS GROUP FOR KR(12)=1 OR 6 OR FOR KR(7)=1 OR 3 ****

CARD 1. FORMAT(I3,F7.0,7F10.4) **** USED ONLY FOR KR(12)=0,2,5, OR 7

FIELD 1 (COLUMNS 1-3, RIGHT-JUSTIFIED). IS

NUMBER OF ELEMENTS IN THE SYSTEM INCLUDING ELECTRONS IF CONSIDERED (THIS ENTRY WILL BE THE SAME AS CARD 1 OF GROUP 2 (EXCEPT FOR THE DIFFERENT FORMAT) FOR SYSTEMS NOT CONTAINING ELECTRONS BUT WILL BE ONE GREATER FOR SYSTEMS CONTAINING ELECTRONS)

FIELDS 2 AND 3 (COLUMNS 4-10,11-20) FFAR, FITMOL

CONSTANTS IN THE CURVEFIT OF FF(J) IN TERMS OF MOLECULAR WEIGHT..

$$FF(J)=(WTM(J)/FITMOL)^{**}FFAR$$

FFAR AND FITMOL ARE PRESUMED TO BE 0.431 AND 23.4 IF NO ENTRY IS MADE.

FIELDS 4, 5, AND 6 (COLUMNS 21-30, 31-40, 41-50) BASMOL, SIGMA, EPOVRK

THESE VARIABLES DEFINE THE REFERENCE SPECIES PROPERTIES FOR FF(J) (REF. 5). BASMOL IS THE MOLECULAR WEIGHT OF THE REFERENCE SPECIES. SIGMA AND EPOVRK ARE THE SPECIES SIGMA AND EPSILON/K AS DEFINED BY REFERENCE 6. FOR THE CONVENIENCE OF THE USER, A TABLE OF SIGMA AND EPOVRK REPRODUCED FROM REFERENCE 6 IS INCLUDED AS APPENDIX II TO THIS MANUAL. STANDARD VALUES DESCRIBED IN REFERENCE 5 ARE USED IF NO ENTRIES ARE MADE.

FIELD 7 (COLUMNS 71-80) TF(N+1) **** USED ONLY FOR KR(9) = 2 WITH KR(11) = 0 ****

ABLATION TEMPERATURE, ABOVE WHICH EQUILIBRIUM CHAR REMOVAL RATE WILL BE DETERMINED. BELOW THIS TEMPERATURE, SURFACE EQUILIBRIUM IS SUPPRESSED. AUTOMATICALLY SET TO 50,000 K IF NO ENTRY. AN ABLATION TEMPERATURE MUST BE ENTERED HERE IF SURFACE CHEMISTRY IS TO BE CONSIDERED.

CARDS 2,3,...,IS (ONE FOR EACH ELEMENT, SEE CARD 1, FIELD 1 OF THIS GROUP), FORMAT(I3,3A4,F9.3,7E8.3) **** USED ONLY FOR KR(12)=0,2,5, OR 7 ***

FIELD 1 (COLUMNS 1-3, RIGHT-JUSTIFIED), KAT(K)

ATOMIC NUMBER OF ELEMENT (99 FOR ELECTRON). CARDS MUST BE ORDERED WITH THIS NUMBER ASCENDING WITH ELECTRON LAST (WHEN CONSIDERED).

FIELD 2, (COLUMNS 4-15) ATA(K), ATB(K), ATC(K)

NAME OF ELEMENT (USED FOR OUTPUT ONLY). FOR BEST LOOKING OUTPUT, ELEMENTS WITH 3 OR 4 LETTERS (e.g., IRON) SHOULD START IN COLUMN 6, ELEMENTS WITH 5, 6, OR 7 LETTERS (e.g., CARBON) SHOULD START IN COLUMN 5, AND ELEMENTS WITH 8 OR MORE LETTERS (e.g., NITROGEN) SHOULD START IN COL. 4.

FIELD 3 (COLUMNS 16-24), WAT(K)

ATOMIC WEIGHT OF ELEMENT

FIELD 4 (COLUMNS 25-32) TK(K,1)

AMOUNT OF ELEMENT IN BOUNDARY-LAYER EDGE GAS. SEE BELOW FOR UNITS.

FIELDS 5 TO 10 (COLUMNS 33-40, 41-48, 49-56, 57-64, 65-72, 73-80) TK(K,J) J=2,7

AMOUNT OF ELEMENT IN PYROLYSIS GAS AND CHAR FOR EACH OF THE THREE ALLOWABLE MATERIALS. FIELDS 5 AND 6 ARE FOR MATERIAL 1, FIELDS 7 AND 8 FOR MATERIAL 2, ETC. NEGATIVE VALUES ARE USED TO DESIGNATE RELATIVE MASSES OF ELEMENTS, WHEREAS POSITIVE VALUES ARE USED TO DESIGNATE RELATIVE NUMBERS OF ATOMS. AS AN EXAMPLE OF THE LATTER, THE ENTRIES FOR A SILICA CHAR COULD BE 1. FOR THE ELEMENT SILICON AND 2. FOR OXYGEN.

GROUP 12 DIFFUSION FACTOR DATA (CALLED FROM INPUT)
**** SKIP THIS GROUP FOR KR(7)=1 OR 3 OR FOR KR(12)=1 OR 6 OR IF IT IS DESIRED TO USE THE MOLECULAR WEIGHT APPROXIMATION FOR DIFFUSION FACTORS (SEE FIELDS 2 AND 3 OF CARD 1 OF GROUP 11). ALWAYS SKIP FOR KR(7)=1 OR 3. ****

CARD 1. FORMAT(I3) ***** USED ONLY FOR KR(12)=0, 2, 5 OR 7 AND THEN ONLY IF IT IS DESIRED TO READ IN DIFFUSION FACTOR DATA FOR ONE OR MORE SPECIES *****

FIELD 1 (COLUMNS 1-3, RIGHT-JUSTIFIED) NFF

NUMBER OF MOLECULES FOR WHICH DIFFUSION FACTOR DATA ARE TO BE READ (SEE FIELDS 2 AND 3 OF CARD 1 OF GROUP 11).

CARDS 2, 3,... AS REQUIRED (DIFFUSION FACTOR DATA REQUESTED BY CARD 1 OF THIS GROUP ARE ENTERED HERE 4 TO A CARD) FORMAT(4(2A4,E12.4))
***** USED ONLY FOR KR(12)=0, 2, 5 OR 7 AND THEN ONLY IF THE CONDITIONS OF CARD 1 OF THIS GROUP ARE MET *****

FIELDS 1, 3, 5, AND 7 (COLUMNS 1-8, 21-28, 41-48, AND 61-68, RESPECTIVELY) NFIA(J) AND NFIB(J) IN EACH FIELD

NAME OF MOLECULE AS IT APPEARS IN COLUMNS 73-80 ON FIRST CARD OF 3-CARD THERMODYNAMIC DATA SET FOR THE MOLECULE (SEE GROUP 13, CARDS 1, 4, 7, .)

FIELDS 2, 4, 6, AND 8 (COLUMNS 9-20, 29-40, 49-60, AND 69-80 RESPECTIVELY) FFIN(J) IN EACH FIELD

A SET OF FF(J) ARE INCLUDED IN THE PROGRAM. IF ANY OF THESE ARE TO BE CHANGED, THE NEW VALUES FOR EACH OF THE SPECIES NAMED IN FIELDS 1,3,5 ETC. ARE ENTERED HERE UNDER THE VARIABLE NAME FFIN(J). THEY ARE THEN SORTED BY SPECIES NAME AND ENTERED INTO THE PROPER SLOTS IN THE FF(J) ARRAY. THESE DIFFUSION FACTORS ARE REFERENCED TO OXYGEN (O2) OR OTHER REFERENCE SPECIES INDICATED IN GROUP 11. TO OBTAIN ACCURATE VISCOSITY CALCULATIONS USE

FF(J)=(SIGMA(J)*WTM(J)**.25*EPOVRK(J)**.0795)/(SIGMA(REF)*WTM(REF)**.25*EPOVRK(REF)**.0795)

GROUP 13 THERMOCHEMICAL DATA (CALLED FROM INPUT)
***** SKIP THIS GROUP FOR KR(12)=1 OR 6 OR KR(7)=1 OR 3 *****

THERE ARE THREE CARDS FOR EACH MOLECULAR, ATOMIC, CONDENSED, OR IONIC SPECIES. A TOTAL OF 70 SPECIES OF ALL TYPES ARE ALLOWED. THE NUMBER OF ALLOWABLE CONDENSED-PHASE MATERIALS WHICH CAN BE SIMULTANEOUSLY PRESENT IN ANY SOLUTION IS 4. ANY NUMBER OF CONDENSED PHASE SPECIES CAN BE INCLUDED IN THE THERMOCHEMICAL DATA DECK. (NOTE... CONDENSED SPECIES ARE REQUIRED IN SURFACE EQUILIBRIUM CALCULATIONS FOR CONSIDERATION AS CANDIDATE SURFACE MATERIALS BUT ARE NOT PRESENTLY CONSIDERED AS CANDIDATE SPECIES WITHIN THE BOUNDARY LAYER). A BLANK CARD AFTER THE LAST SET CONCLUDES THE THERMODYNAMIC DATA. THE ARRANGEMENT OF THESE CARD SETS IS OF CONSEQUENCE IN SO FAR AS IT DETERMINES THE BASE SPECIES UPON WHICH MASS BALANCES ARE PERFORMED, THE FIRST INDEPENDENT SET OF BASE SPECIES BEING SELECTED. SINGULAR MATRICES CAN RESULT FROM CERTAIN SETS OF THEORETICALLY ACCEPTABLE BASE SPECIES DUE TO ROUND-OFF ERRORS. FURTHERMORE, MASS BALANCES, ETC. FOR THE (NSP)TH BASE SPECIES (SEE CARD 1 OF GROUP 2) IS OBTAINED BY DIFFERENCE. THEREFORE, THE ELEMENT REPRESENTED BY THIS BASE SPECIES SHOULD BE PRESENT IN APPRECIABLE QUANTITIES THROUGHOUT THE BOUNDARY LAYER. FOR EXAMPLE, FOR ABLATION IN AIR, MOLECULAR NITROGEN IS A GOOD CHOICE FOR THE (NSP)TH BASE SPECIES. FINALLY, THE ORDER OF THE BASE SPECIES DETERMINES THE REACTANTS FOR KINETICS PROBLEMS (SEE GROUP 14, CARD 3) EXCEPT FOR THESE CONSIDERATIONS, ATOMIC, MOLECULAR, AND CONDENSED SPECIES CAN BE ARRANGED IN ANY ORDER. WHEN IONIZED FLOWS ARE CONSIDERED, THE ATOMIC, MOLECULAR AND CONDENSED SPECIES DATA MUST APPEAR FIRST AND BE FOLLOWED BY, FIRST, ELECTRON SPECIES DATA, AND THEN THE IONIC SPECIES DATA (WHICH CAN BE IN ANY ORDER). THE DATA FORMAT ACCEPTED BY THE PROGRAM (DESCRIBED BELOW) IS AS GENERATED BY THE AEROTHERM TCDATA PROGRAM AND IS THE SAME AS THAT USED IN NAVWEPS REPORT 7043. THERMOCHEMICAL DATA DECKS HAVE BEEN GENERATED FOR ABOUT 600 SPECIES, BASED MOSTLY ON CURVE FITS OF JANAF DATA.

CARDS 1, 4, 7, ... ONE FOR EACH MOLECULE FORMAT(7(F3.0,I3),30X,2A4)
***** USED ONLY FOR KR(12)=0, 2, 5 OR 7 *****

FIELDS 1, 3, 5, ..., ONE FOR EACH ELEMENT IN MOLECULE (COLUMNS 1-3, 7-9, 13-15, ...), ALPT(N) IN EACH FIELD

NUMBER OF ATOMS (OF ATOMIC NUMBER GIVEN IN SUBSEQUENT FIELD) IN A MOLECULE OF THIS SPECIES. IF FIELD ONE IS ZERO THIS CARD IS PRESUMED TO BE THE END OF THE THERMODYNAMIC DATA.

FIELDS 2, 4, 6, ..., ONE FOR EACH ELEMENT IN MOLECULE (COLUMNS 4-6, 10-12, 16-18, ...), JAT(N) IN EACH FIELD

ATOMIC NUMBERS OF ELEMENTS IN MOLECULES (LISTED IN ASCENDING SEQUENCE).

LAST FIELD (COLUMNS 73-80)

MOLECULAR DESIGNATION (e.g., SIO2) FOR OUTPUT AND AS IDENTIFIER FOR DIFFUSION FACTOR DATA.

CARDS 2, 5, 8, ..., ONE FOR EACH MOLECULE FORMAT(6E9.6,6X,F6.0,I1)
***** USED ONLY FOR KR(12)=0, 2, 5 OR 7 *****

FIELD 1 (COLUMNS 1-9), HA(J)

HEAT OF FORMATION OF MOLECULE AT 298 DEG K FROM JANAF BASE STATE (ELEMENTS IN MOST NATURAL FORM AT 298 DEG. K), CAL/MOLE.

FIELDS 2-6 (COLUMNS 10-18, 19-27, 28-36, 37-45, AND 46-54), CH(J,1), RC(J,1),RD(J,1),RE(J,1), RF(J,1)

CONSTANTS APPROPRIATE TO LOWER TEMPERATURE RANGE OF THERMODYNAMIC DATA, TAKING F2, F3, ..., AS FIELDS 2, 3, ETC., THE CURVE FITS ARE AS FOLLOWS WITH T IN DEG K, H IN CAL/MOLE, AND S IN CAL/MOLE DEG K.

HEAT CAPACITY, CP=F3+F4*T+F5/T**2

ENTHALPY, H-H298=F2+F3*(T-3000)+0.5*F4*(T**2-3000**2)
-F5*(1/T-1/3000)

ENTROPY, S=F6+F3*LN(T/3000)+F4*(T-3000)-0.5*F5*(1/T**2-1/3000**2)

FIELD 7 (COLUMNS 61-66), TU(J,1)

UPPER LIMIT OF LOWER TEMPERATURE RANGE IN DEG K. (FOR CONDENSED-PHASE MATERIALS WHICH MELT, IT IS APPROPRIATE TO USE MELT TEMPERATURES).

FIELD 8 (COLUMN 67), KPHA(I)

1 SIGNIFIES GASEOUS SPECIES

2 SIGNIFIES SOLID SPECIES

3 SIGNIFIES LIQUID SPECIES

CARDS 3, 6, 9, ..., ONE FOR EACH MOLECULE FORMAT(6E9.6,6X,F6.0,I1)
***** USED ONLY FOR KR(12)=0, 2, 5 OR 7 *****

FIELDS 1-8 (COLUMNS 1-67)

SAME AS CARDS 2, 5, 8, ..., EXCEPT USE CONSTANTS FOR UPPER TEMPERATURE RANGE AND FIELD 7 IS THE FAIL TEMPERATURE OF THIS SPECIES AS A SURFACE.

LAST CARD .... AS MENTIONED PREVIOUSLY, A BLANK CARD IS USED TO SIGNIFY THE END OF THERMOCHEMICAL DATA

GROUP 14 SURFACE KINETIC DATA (CALLED FROM INPUT)
**** SKIP THIS GROUP FOR KR(12)=0,1, OR 2 OR KR(7)= 1 OR 3 ****

REACTIONS OF THE SURFACE MATERIALS WITH ADJACENT BOUNDARY LAYER GASES CAN BE KINETICALLY CONTROLLED ACCORDING TO AN ARRHENIUS TYPE RELATION. FOR EXAMPLE, IN THE REACTION

C* + 1/2 O2 → CO

THE MASS FLUX RELATION IS

$$\frac{\dot{m}_C}{\mathfrak{M}_C} = FKF * \exp\left(EAK/(1.9869*T)\right) * \left(P_{O_2}^{\frac{1}{2}} - \frac{P_{CO}}{K_p}\right)^{EXK}$$

WHERE
$\dot{m}_C$ = CARBON MASS FLUX
$\mathfrak{M}_C$ = CARBON MOLECULAR WEIGHT
FKF = PRE-EXPONENTIAL FACTOR
EAK = ACTIVATION ENERGY
T = TEMPERATURE
P = PARTIAL PRESSURE OF THE SUBSCRIPTED SPECIES
K = EQUILIBRIUM CONSTANT
EXK = REACTION ORDER

THESE CONSTANTS AND FACTORS ARE INPUT ON THE CARDS DESCRIBED BELOW. FURTHER DISCUSSION OF KINETIC MODELS FOR ABLATION CAN BE FOUND IN REFERENCE 7. FOR EXAMPLE-

CARD 1. FORMAT(I3)

FIELD 1 (COLUMNS 1-3,RIGHT JUSTIFIED), MT

NUMBER OF KINETICALLY CONTROLLED REACTIONS TO BE CONSIDERED. IF TWO PROBLEMS ARE STACKED TOGETHER SEPARATED BY A COMMA (SEE CARD 1 OF LAST GROUP) AND IF THE FIRST IS A KINETICS PROBLEM AND THE SECOND IS TO BE EQUILIBRIUM, THEN FOR THE SECOND, KINETICS MUST BE TURNED OFF USING KR(12)=5,6 OR 7 AND MT=0.

CARDS 2,5,8,... ONE FOR EACH KINETICALLY CONTROLLED REACTION, FORMAT(8E10.4)

FIELD 1 (COLUMNS 1-10), FKF(N)

PRE-EXPONENTIAL FACTOR FOR SURFACE MASS BALANCES IN LB-MOLES OF REACTANT PER FT**2 PER SECOND.

FIELD 2 (COLUMNS 11-20), EAK(N)

ACTIVATION ENERGY FOR THE FORWARD REACTION IN CALORIES PER GRAM-MOLE

FIELD 3 (COLUMNS 21-30), EXK(N)

REACTION EXPONENT. THE DRIVING POTENTIAL AS OBTAINED FROM THE REACTION STOICHIOMETRY IS RAISED TO THIS POWER IN EVALUATING THE REACTION RATE. EXK = 1.0 IS RECOMMENDED.

CARDS 3,6,9,... ONE FOR EACH KINETICALLY CONTROLLED REACTION, FORMAT(8E10.4)

FIELDS 1,2,3,..., ONE FOR EACH BASE SPECIES (COLUMNS 1-10,11-20,...), RMU(K,N)

STOICHIOMETRIC COEFFICIENTS ON REACTANTS. IN THE PRESENT FORMULATION ONLY BASE SPECIES MAY BE USED AS REACTANTS. THUS SOME CARE MUST BE USED IN ESTABLISHING THE ORDER OF GROUP 13.

CARDS 4,7,10,... ONE FOR EACH KINETICALLY CONTROLLED REACTION, FORMAT(8E10.4)

FIELDS 1,2,3,..., ONE FOR EACH BASE SPECIES (COLUMNS 1-10,11-20,...), PMU(K,N)

STOICHIOMETRIC COEFFICIENTS ON THE PRODUCTS, OR ON THEIR EQUILIBRIUM BASE SPECIES EQUIVALENTS IF THEY ARE NOT BASE SPECIES. FOR EXAMPLE IF THE BASE SPECIES ARE CO, H2O, H2, AND C* FOR A SYSTEM WHERE C* IS THE ONLY ISOLATED (NONEQUILIBRIUM) SPECIES, A REACTION WRITTEN AS

$$H2 + 2C^* = C2H2$$

COULD EQUIVALENTLY BE WRITTEN

$$H2 + 2C^* = 2CO + 3H2 - 2H2O$$

AND THIS IS THE MANNER IN WHICH THE PRODUCT COEFFICIENTS WOULD BE INPUT. THIS EQUIVALENT REPRESENTATION CAN NOT BE USED FOR REACTANTS.

GROUP 15 STREAMWISE DISTRIBUTIONS FOR EDGE CONDITIONS (CALLED FROM REFCON)

CARD SET 1. FORMAT(8E10.4) **.**** USED ONLY FOR KR(5)=5 *****

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD, DSIP(L), L=1,NS (SEE CARD 3 OF GROUP 3)

DECREASE IN EDGE ENTROPY FROM PREVIOUS STATION TO CURRENT STATION, CAL/GM DEG K (THE STAGNATION POINT ENTROPY IS COMPUTED BY THE PROGRAM. DSIP IS USED TO DECREMENT THE ENTROPY AT DOWNSTREAM STATIONS TO TAKE INTO ACCOUNT SHOCK CURVATURE. DSIP(1) SHOULD BE SET EQUAL TO ZERO.)

CARD 2. FORMAT (I2,E8.5,7E10.5) ***** USED ONLY FOR KR(5) = 2,3 OR 4*****

FIELD 1-5 (COLUMN 1-2, 3-10, 11-20, 21-30, 31-40) NEN, UINF, RHOINF, HINF, PINF

NEN NUMBER OF ENTROPY OR SHOCK LAYER POINTS (MAXIMUM OF 20)

**UINF FREE STREAM VELOCITY, FT/SEC

**RHOINF FREE STREAM DENSITY, LB/FT3

*HINF FREE STREAM ENTHALPY, BTU/LB

*PINF STATIC PRESSURE, ATMOSPHERES

* ENTRY REQUIRED IF FREE STREAM STREAM FUNCTION POSITION GIVEN
* ENTRY REQUIRED IF ENTROPY DATA GIVEN IN TERMS OF SHOCK ANGLE (SEE CARD SET 3 AND 4)

CARD SET 3. FORMAT (A1,E9.4,7E10.4/8E10.4) ***** USED ONLY IF KR(5) = 2,3 OR 4 AND NEN > 0

FIELD 1 (COLUMN 1) IRED,

ALPHABETIC CHARACTER DESCRIPTIVE OF DATA IN SUBSEQUENT FIELDS:

I	FREE STREAM STREAM FUNCTION POSITION IN INCHES (NORMAL TO CENTERLINE)
F	FREE STREAM STREAM FUNCTION POSITION IN FEET (NORMAL TO CENTERLINE)
BLANK	STREAM FUNCTION VALUE IN LB/SEC/RAD FOR AXISYMMETRIC BODIES OR LB/SEC/FT FOR PLANAR BODIES

FIELDS 2,3, ... NEN+1 (COLUMNS 2-10, 11-20, 21-30 ETC. 8 TO A CARD) SF(I), I=1,NEN

WHERE THE SF ARE AS DESCRIBED ABOVE

CARD SET 4. FORMAT (A1, E9.4,7E10.4/8E10.4) ***** USED ONLY IF KR(5) =2,3 OR 4

FIELD 1 (COLUMN 1) IKED

ALPHANETIC CHARACTER DESCRIPTIVE OF DATA IN SUBSEQUENT FIELDS:

D	SHOCK ANGLE* IN DEGREES
R	SHOCK ANGLE* IN RADIANS
BLANK	ENTROPY (BTU/LB DEG R) RELATIVE TO CENTERLINE VALUE

*THE SHOCK ANGLE IS DEFINED RELATIVE TO THE CENTERLINE.

FIELDS 2,3, ... NEN+1 (COLUMNS 2-10, 11-20, 21-30, ETC 8 TO A CARD) CS(I), I=1,NEN

WHERE THE CS ARE AS DESCRIBED ABOVE, CORRESPONDING TO STREAM FUNCTION DATA OF CARD SET 3. IF NEN ENTERED AS ZERO ON CARD 2, NEN SET TO NUMBER OF STATIONS AND STREAM FUNCTIONS CORRESPOND TO ROKAP VALUES OF CARD SET 2 OF GROUP 5.

CARD SET 5. FORMAT (8E10.4) ***** USED ONLY IF KR(5) = 4

FIELDS 1,2, ... NEN

TOTAL ENTHALPY, BTU/LB, RELATIVE TO CENTERLINE VALUE CORRESPONDING TO STREAM FUNCTION DATA OF CARD SET 3.

CARD 6. FORMAT(I2) ***** USED ONLY IF CARD SET 1 OR 2 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), IDSIP

ITEM WHEN DATA ABOVE (CARD SET 1 TO 5) IS TO BE UPDATED WHERE ITEM INDEX ON TIME (OR SUBCASE) USE BLANK CARD IF DATA IS TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 7. FORMAT(8E10.4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD, PRS(L), L=1,NS (SEE CARD 3 OF GROUP 3)

RATIO OF LOCAL STATIC TO STAGNATION PRESSURE. IN ADDITION TO DEFINING THE LOCAL PRESSURE, THIS DATA IS USED TO FORM THE LOCAL VELOCITY GRADIENT AT THE STAGNATION POINT AND OTHER BODY STATIONS. DUE TO THE SENSITIVITY OF THE PROGRAM TO THE VELOCITY GRADIENT IN THE STAGNATION REGION, TWO OPTIONS HAVE BEEN INCORPORATED TO ALLOW A SMOOTHER VELOCITY GRADIENT DISTRIBUTION THAN IS TYPICALLY OBTAINED BY READING NUMBERS FROM A SET OF CURVES. FOR EXAMPLE, THE VARIOUS OPTIONS ARE CONTROLLED BY THE ENTRIES IN THIS PRESSURE TABLE AND THE EFFECTIVE NOSE RADIUS ENTRY (GROUP 5, CARD 1, FIELD 2).

1) PRE(1) IS READ IN BUT RNOSE IS NOT

THE INPUT PRESSURES ARE CURVE FITTED AND PRESSURE AND VELOCITY GRADIENTS ARE EVALUATED DIRECTLY FROM THE RESULTING CURVE.

2) PRE(1) AND RNOSE BOTH READ IN.

STAGNATION POINT VELOCITY GRADIENT EVALUATED FROM

DUES = 1./RNOSE*SQRT(2.*PE/RHOE*32.174*2116.)

3) PRE(1) NOT READ IN. AND PRE ( ) NOT READ IN FOR AN ARBITRARY NUMBER OF STATIONS.

IN THIS INSTANCE HE VELOCITY GRADIENT IS ASSUMED TO BE LINEAR AND A NEWTONIAN PRESSURE DISTRIBUTION FOR SMALL S/R IS ASSUMED AT THOSE STATIONS FOR WHICH NO PRESSURE IS INPUT. FIRST, AN EFFECTIVE NOSE RADIUS, RNOSE, IS COMPUTED FROM THE FIRST NONZERO PRESSURE ENTRY FROM THE RELATION

RNOSE = S(L)/SQRT(1-PRE(L))

THE STAGNATION POINT VELOCITY GRADIENT IS THEN FOUND AS IN OPTION (2) ABOVE. PRESSURE FOR STATION LL LESS THAN L IS FOUND FROM

PRE(LL) = 1. - (S(LL)/RNOSE)**2

CARD 8. FORMAT(I2) ***** USED ONLY IF CARD SET 3 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), IPRE

ITEM WHEN PRE IS TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE) USE BLANK CARD IF PRE IS TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 9. FORMAT(8E10.4)

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD, RADR(L), L=1,NS (SEE CARD 3 OF GROUP 3)

RATIO OF LOCAL TO STAGNATION POINT INCIDENT RADIATION. THIS INFORMATION IS USED ONLY FOR KR(9) OR KR9 OF 4. INPUT BLANKS INTO THIS FIELD FOR OTHER TYPES OF PROBLEMS.

CARD 10. FORMAT(I2)

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), IRAD

ITEM WHEN RADR IS TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE) USE BLANK CARD IF RADR IS TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR IF NO MORE TIMES ARE TO BE CONSIDERED.

GROUP 16 STREAMWISE DISTRIBUTIONS FOR INPUT WALL CONDITIONS
(CALLED FROM REFCON)

CARD SET 1, FORMAT(8F10.4) *** USED ONLY FOR KR(11)=1 AND KR(9)=0,1, OR 2 **

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD,
HW(L,1), L=1,NS (SEE CARD 3 OF GROUP 3)

ENTHALPY OF THE GAS AT THE WALL, BTU/LB

CARD 2, FORMAT(I2) ***** USED ONLY IF CARD SET 1 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), IHW

ITEM WHEN HW IS TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE).
USE BLANK CARD IF HW IS TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR
IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 3, FORMAT(8F10.4) ***** USED ONLY IF KR(11)=0 AND KR(9)=0,1, OR 2,
IF KR(9)=3 OR IF ANY OF THE KR9=2 OR 3 ****

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD,
TW(L,1), L=1,NS (SEE CARD 3 OF GROUP 3)

WALL TEMPERATURE, DEG R

CARD 4, FORMAT(I2) ***** USED ONLY IF CARD SET 3 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), ITW

ITEM WHEN TW IS TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE).
USE BLANK CARD IF TW IS TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR
IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 5, FORMAT(8F10.4) ***** USED ONLY FOR KR(9)=0 AND KR(11)=0 OR 1 ***

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD,
FW(L,1), L=1,NS (SEE CARD 3 OF GROUP 3)

WALL STREAM-FUNCTION (NEGATIVE FOR MASS ADDITION)

CARD 6, FORMAT(I2) ***** USED ONLY IF CARD SET 5 IS USED *****

FIELD 1 (COLUMNS, 1-2, RIGHT-JUSTIFIED), IFW

ITEM WHEN FW IS TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE). USE BLANK CARD IF FW IS TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 7, FORMAT(8F10.4) ***** USED ONLY FOR KR(9)=1 AND KR(11)=0 OR 1 ***

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD, RHOVW(L,1), L=1,NS (SEE CARD 3 OF GROUP 3)

TOTAL MASS FLUX AT THE WALL (LB/SEC FT2 O DIMENSIONLESS FOR KR(8)=0 OR 1, RESPECTIVELY, POSITIVE FOR MASS INJECTION)

CARD 8, FORMAT(I2) ***** USED ONLY IF CARD SET 7 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), IRHOVW

ITEM WHEN RHOVW IS TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE). USE BLANK CARD IF RHOVW IS TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 9, FORMAT(8F10.4) **** USED ONLY FOR KR(7)=0 OR 2, KR(9)=0 OR 1, AND KR(11)=0 OR 1.

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD, DO K=1,NSPM1 SPW(K,L,1), L=1,NS NSPM1=NSP-1 (SEE CARD 1 OF GROUP 2 AND CARD 3 OF GROUP 3)

WALL ELEMENTAL MASS FRACTIONS IN THE SAME ORDER THAT THEY ARE SELECTED FROM THE THERMODYNAMIC DATA (SEE DISCUSSION UNDER GROUP 13)

CARD 10, FORMAT(I2) ***** USED ONLY IF CARD SET 9 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), ISPW

ITEM WHEN THE SPW ARE TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE). USE BLANK CARD IF THE SPW ARE TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR IF NO MORE TIMES ARE TO BE CONSIDERED.

CARD SET 11, FORMAT(8F10.4) **** USED ONLY FOR KR(7)=0 OR 2 WITH KR(9)=2 AND KR(11)=0,1, OR 2, OR WITH ANY OF THE KR9=2

FIELD 1 (COLUMNS 1-10), FIELD 2 (COLUMNS 11-20), ETC., 8 TO A CARD, DO N=1,3 FLUXJ(N,L,1), L=1,NS (SEE CARD 3 OF GROUP 3)

WALL MASS FLUXES OF BOUNDARY LAYER EDGE GAS, PYROLYSIS GAS, AND CHAR, RESPECTIVELY (SEE GROUP 11, CARDS 2,3, ..., FIELD 4), LB/SEC FT2 OR DIMENSIONLESS FOR KR(8) = 0 OR 1, RESPECTIVELY. POSITIVE FOR MASS INJECTION WHEN KR(8) = 0 AND NEGATIVE FOR MASS INJECTION WHEN KR(8)=1. READ IN ALL EDGE GAS VALUES, THEN START PYROLYSIS GAS VALUES ON A NEW CARD AND READ ALL PYROLYSIS GAS VALUES, ETC.

CARD 12 FORMAT(I2) ***** USED ONLY IF CARD SET 11 IS USED *****

FIELD 1 (COLUMNS 1-2, RIGHT-JUSTIFIED), IFLUXJ

ITEM WHEN THE FLUXJ ARE TO BE UPDATED WHERE ITEM IS INDEX ON TIME (OR SUBCASE). USE BLANK CARD IF THE FLUXJ ARE TO REMAIN UNCHANGED FOR ALL REMAINING TIMES OR IF NO MORE TIMES ARE TO BE CONSIDERED.

GROUPS 17,18,19, ..., (13+NITEM) SEE CARD 1 OF GROUP 3 (CALLED FROM REFCON)

UPDATING INFORMATION FOR STREAMWISE DISTRIBUTIONS OF EDGE AND WALL CONDITIONS FOR TIMES 1,2,3, ..., NITEM-1. NO ADDITIONAL INFORMATION AFTER GROUP 16 IS REQUIRED FOR NITEM = 1 OR IF CARDS 2,4,6,... OF GROUPS 15 AND 16 ARE ALL BLANK. DATA ARE SUPPLIED FOR EACH SET AND ONLY EACH SET OF STREAMWISE INFORMATION FOR WHICH THE CURRENT TIME HAS BEEN DESIGNATED IN A PREVIOUS GROUP (E.G. CONSIDER TW AT TIME 4 (GROUP 19). TW DATA (I.E., CARD SET 3 AND CARD 4 OF GROUP 16 WOULD BE REQUIRED IF A 4 HAS APPEARED IN CARD 4 OF GROUP 18,17 OR 16) ALL DATA REQUIRED AT TIME 2 (IF ANY) ARE SUPPLIED. FIRST (GROUP 17), THEN FOR TIME 3 (GROUP 18), TIME 4 (GROUP 19), ETC. FOR EACH TIME, THESE DATA ARE SUPPLIED IN THE SAME ORDER AS LISTED UNDER GROUPS 15 AND 16. FORMATS ARE THE SAME AS IN GROUPS 15 AND 16. IN PARTICULAR, IT SHOULD BE NOTED THAT EACH ODD-NUMBERED CARD MUST BE FOLLOWED BY THE APPROPRIATE EVEN-NUMBERED CARD SIGNIFYING FOR WHAT TIME (IF ANY) DATA OF THIS SAME TYPE IS TO BE UPDATED AGAIN.

LAST GROUP (CALLED FROM RLIMP)

CARD 1 FORMAT(A1)

FIELD 1 (COLUMN 1), JAST

THE PURPOSE OF THIS ENTRY IS TO PERMIT A TEST ON WHETHER OR NOT A NEW CASE IS TO FOLLOW. IN THE EVENT A CASE DOES NOT CONVERGE IN THE ALLOTTED NUMBER OF ITERATIONS, ANY REMAINING CARDS FOR THAT CASE ARE READ AND THEN IGNORED UNTIL A COMMA (,) OR A PERIOD (.) IS ENCOUNTERED IN COLUMN 1. A COMMA SIGNIFIES ANOTHER CASE, WHILE A PERIOD SIGNIFIES THAT THERE ARE NO CASES TO FOLLOW.

SECTION II

FORTRAN VARIABLES LIST

The revised Fortran Variables List is contained in this section.

FORTRAN VARIABLES LIST

A(N,NN)	ERROR COEFFICIENT ARRAY IN CHEMISTRY SOLUTION, N PERTAINS TO EQUATION WHEREAS NN PERTAINS TO VARIABLE.	C EQTCOM
AA	PRODUCT OF PRESSURE TIMES MOLECULAR WEIGHT.	C EQTCOM
AAA	DEFUNCT VARIABLE, SET TO UNITY.	C EQPCOM
AR	LOCALLY DEFINED VARIABLE	L SLOPQ
ARR	LOCALLY DEFINED VARIABLE	L SLOPQ
ARER	ABSOLUTE VALUE OF RATIO OF A MASS BALANCE ERROR TO LARGEST TERM IN THAT MASS BALANCE.	L MATER
ABSVA	ABSOLUTE VALUE OF CONTRIBUTION OF A SPCIES TO A MASS BALANCE.	L MATER
ARX	ABSOLUTE VALUE OF LOG CORRECTION ON TEMPERATURE.	L CRECT
AC	LOCALLY DEFINED VARIABLE	L SLOPQ
ACC	LOCALLY DEFINED VARIABLE	L SLOPQ
ACH	MACH NUMBER	L OUTPUT
ADUM	COEFFICIENT IN SURFACE KINETIC LATION FOR MATERIAL BEING CONSIDERED UNDER (R(9) = 5 OR EE INPUT INSTRUCTIONS).	C CRBCOM
AF	LOCALLY DEFINED VARIABLE	L TRMBL
ALF	DERIVATIVE OF LOG MOLECULAR WEIGHT WITH RESPECT TO LOG TEMPERATURE AT CONSTANT PRESSURE.	L EQUIL
ALP(K)	INPUT MASS QUANTITY OF ELEMENTS, EQ(25) OF NASA CR-1064.	C EQTCOM
ALPH	NORMALIZING PARAMETER FOR BOUNDARY LAYER NORMAL COORDINATE, SEE EQ. (33) OF NASA CR-1062.	C VARCOM
ALPHD	D1*ALPH + D2*HALPH WHERE D1 AND D2 ARE DEFINED BY EQ(88) OR (89) OF NASA CR-1062.	C HISCOM
ALPT(N)	NUMBER OF ATOMS OF AN ELEMENT WITH ATOMIC NUMBER JAT(N) IN A SPECIES.	L INPUT
ALSQ	ALPH**2	L FIRSTG

AM(N,NN)	COEFFICIENTS IN THE MATRIX DEFINED AS (BNL) IN EQ(150) OF NASA CR-1062.	C NONCOM
AMOA	ALPHANUMERIC VARIABLE, FIRST OF TWO PORTIONS OF SPECIES NAME.	L INPUT
AMOB	ALPHANUMERIC VARIABLE, SECOND OF TWO PORTIONS OF SPECIES NAME.	L INPUT
AMU5	VN(J) * WTM(J)/(FF(J) * (WOZ-VN(J) * FF(J) * WD7)) SUMMED OVER ALL SPECIES N *.	L PROPS
APE(N,NN)	SAVED ARRAY A(N,NN) DURING IVERSION.	L EQUIL
AR	WEIGHTING FACTOR IN LINEARIZING EQUILIBRIUM ASPECT OF KINETICALLY CONTROLLED MASS BALANCE.	L KINET
AREA	AREA PER UNIT MASS FLOW DURING EXPANSION.	L EQUIL
ARPH	ELEMENTAL MASS FRACTION OF ATOM.	L EQUIL
ARPHM	MAXIMUM CONTRIBUTION TO CALCULATION OF AN ARPH.	L EQUIL
ASTAR	A* USED IN TRANSPORT PROPERTIES	L PROPS
ASU	FIRST FOUR CHARACTERS OF ALPHAMERIC NAME OF ASSIGNED SURFACE SPECIES	C CRBCOM
ATA(K)	ALPHANUMERIC VARIABLE, FIRST OF THREE PORTIONS OF ELEMENT NAME.	C EQPCOM
ATB(K)	ALPHANUMERIC VARIABLE, SECOND OF THREE PORTIONS OF ELEMENT NAME.	C EQPCOM
ATC(K)	ALPHANUMERIC VARIABLE, THIRD OF THREE PORTIONS OF ELEMENT NAME.	C EQPCOM
ATEMP	ABSOLUTE VALUE OF DTEMP	L NONCER
B(N)	ERRORS USED WITH COEFFICIENTS TO YIELD CORRECTIONS IN CHEMISTRY ITERATIONS, IDENTICAL TO BB*.	C EQTCOM
B(N)	ARRAY OF CONSTANTS DEFINED IN BLIMP, IDENTICAL TO BB*.	C INTCOM
B1	SAVED VALUE OF B(1) DURING INVERSION. EQUALS SURFACE EQUILIBRIUM ERROR FOR THAT OPTION.	L EQUIL
B1(I)	DSQ(I-1)/6	C ETACOM
B2(I)	DSQ(I-1)/3	C ETACOM
BA1(N,NN)	MATRIX (BLFF) DEFINED BY FIGURE (3) OF NASA CR-1062 PREMULTIPLIED BY INVERSE OF (ALFF).	C ETACOM

BA?(N,MN)	MATRIX (BLHH) OR (BLKK) DEFINED BY FIGURE (3) OF NASA CR 1062 PREMULTIPLIED BY INVERSE OF (ALHH) OR (ALKK), RESPECTIVELY.	C ETACOM
BASMOL	MOLECULAR WEIGHT OF REFERENCE SPECIES IN DIFFUSION FACTOR CALCULATIONS	C EQTCOM
BDUM	COEFFICIENT IN SURFACE KINETIC RELATION FOR MATERIAL BEING CONSIDERED UNDER KR(9) = 5 OR 6 (SEE INPUT INSTRUCTIONS).	C CRBCOM
BETA	BETAM(L)	C HISCOM
BETAM(L)	STREAMWISE PRESSURE GRADIENT PARAMETER DEFINED BY EQ(53) OF NASA CR-1062.	C HISCOM
BFTH	DERIVATIVE OF LOG MOLECULAR WEIGHT WITH RESPECT TO LOG PRESSURE AT CONSTANT TEMPERATURE.	L EQUIL
BF	LOCALLY DEFINED VARIABLE	L TRMBL
BIP	NOMINALLY ZERO. SET TO 1. TO PREVENT PREMATURE CONVERGENCE	L NONCER
BLOW	BLOWING PARAMETER BASED ON GAS MASS FLUX GIVEN BY RHOVW(IS+1)/(C3 * CH).	C OUTCOM
BLOWCH	CHAR FLUX NORMALIZED BY HEAT TRANSFER COEFFICIENT	L OUTPUT
BLOWPG	PYROLYSIS GAS FLUX NORMALIZED BY HEAT TRANSFER COEFFICIENT	L OUTPUT
BLQEQV	VARIABLE EQUIVALENCED TO BLQCOM FOR DUMPING PURPOSES	L DUMCOM
BS(N)	SAVED ARRAY OF H(N) DURING INVERSION	L EQUIL
BSU	SECOND FOUR CHARACTERS OF ALPHAMERIC VALUE OF ASSIGNED SURFACE SPECIES	C CRBCOM
BULP	LOG (BUMP)	L CRECT
BUMEQV	VARIABLE EQUIVALENCED TO BUMCOM FOR DUMPING PURPOSES	L DUMCOM
BUMP	CONTRIBUTION TO DAMPING FACTOR EASE RESULTING FROM SIGN CHANGES IN CRITICAL ERRORS.	C BUMCOM
BUMP	10**4 * P. CONSTRAINTS ON CORRECTIONS ARE RELAXED FOR PARTIAL PRESSURES BELOW THIS VALUE.	L CRECT
C(K)	GRAM ATOMS OF ELEMENT K IN A MOLECULE.	L INPUT
C1	1. + DZ WHERE DZ IS DEFINED BY EQ(88) OR (89) OF NASA CR-1062.	C HISCOM
C2	-(1+2*DZ) WHERE DZ IS DEFINED BY EQ(88) OR (89) OF NASA CR-1062.	C HISCOM

C3	C3M(L)	C HISCOM
C3M(L)	-1/ALPHASTAR WHERE ALPHASTAR IS THE FLUX NORMALIZING PARAMETER DEFINED BY EQ (44) OF NASA CR-1062.	C HISCOM
C4	BETA = 1 + DZ WHERE DZ IS DEFINED BY EQ(88) OR (89) OF NASA CR-1062.	C HISCOM
C5	1./ALPH	C COECOM
C6	BETA * ALPH**2	C COECOM
C7	-(UE(L)**2)/((ALPH**2)*25036.5)	C COECOM
C8	ALPHD/ALPH	C COECOM
C9	BETA+1.+DZ - ALPHD/ALPH	C COECOM
C10	C7*F(2,I)	C COECOM
C11	DEFINED IN ICOEFF	C COECOM
C12	DEFINED IN ICOEFF	C COECOM
C13	C7 * F(3,I)	C COECOM
C14	(1.+DZ)*F(1,I)+HF(I,5)	C COECOM
C15	PR(I)-1	C COECOM
C16	1./PR(I)	C COECOM
C17	1./SC(I)	C COECOM
C18	CTR*T(I)	C COECOM
C19	CAPC(I)/(ALPH*SC(I))	C COECOM
C20	CAPC(I)/(ALPH*PR(I))	C COECOM
C21	DEFINED IN ICOEFF	C COECOM
C22	DEFINED IN ICOEFF	C COECOM
C23	DEFINED IN ICOEFF	C COECOM
C24	DEFINED IN ICOEFF	C COECOM
C25	DEFINED IN ICOEFF	C COECOM
C26	RHOE(L)/RHO(I)	C COECOM
C28	DEFINED IN ICOEFF	C COECOM

C31	DEFINED IN ICOEFF	C COECOM
C32	NORMALIZED DIFFUSIVE HEAT FLUX CALCULATED IN ICOEFF	C COECOM
C43	DEFINED IN ICOEFF	C COECOM
C53	RHOP(I)/RHO(I)	C COECOM
C56	F(2,I)/ALPH	C COECOM
C73	(1.+DZ) * F(2,I)	C COECOM
C74	DEFINED IN ICOEFF	C COECOM
C75	DEFINED IN ICOEFF	C COECOM
C76	(1.+DZ) * G(1,I)	C COECOM
C77	DEFINED IN ICOEFF	C COECOM
C78	DEFINED IN ICOEFF	C COECOM
C79	DEFINED IN ICOEFF	C COECOM
C80	DEFINED IN ICOEFF	C COECOM
C81	DEFINED IN ICOEFF	C COECOM
C82	DEFINED IN ICOEFF	C COECOM
C83	DEFINED IN ICOEFF	C COECOM
C84	DEFINED IN ICOEFF	C COECOM
C85	DEFINED IN ICOEFF	C COECOM
C86	DEFINED IN ICOEFF	C COECOM
C87	DEFINED IN ICOEFF	C COECOM
C88	DEFINED IN ICOEFF	C COECOM
C89	BETA * (ALPH **2) * CRHO1	L IONLY
C89	-C3 * ALPH * VNUE(L)	L OUTPUT
CAPC(I)	PRODUCT OF DENSITY AND VISCOSITY NORMALIZED BY EDGE VALUE.	C PRPCOM
CASE(N)	ALPHANUMERIC NAME OF CASE.	C INTCOM
CBAR	VALUE OF THE VELOCITY RATIO AT BOUNDARY LAYER NODE KAPPA.	C INTCOM

CDUM	COEFFICIENT IN SURFACE KINETIC RELATION FOR MATERIAL BEING CONSIDERED UNDER KR(9) = 5 OR 6 (SEE INPUT INSTRUCTIONS).	C CRBCOM
CF	MOMENTUM TRANSFER COEFFICIENT GIVEN BY CAPC(1)/ALPH * VMUF(IS)/CH9*F(3,1)	C OUTCOM
CG(MS)	TOTAL ENTHALPY CORRESPONDING TO SF(MS)	C EDGCOM
CGP(MS)	DERIVATIVE OF CG(MS) WITH RESPECT TO ETA	C EDGCOM
CH	HEAT TRANSFER COEFFICIENT BASED ON ENTHALPY POTENTIAL. GIVEN BY -WALLQ/(C3*(G(1,NETA)-G(1,1)))	C OUTCOM
CHA	HEAT-TRANSFER COEFFICIENT CALCULATED BY EQ (21) OF REFERENCE 6 FOR THE SPECIAL CASE OF EQUAL DIFFUSION COEFFICIENTS	L FELTRU
CHE(N)	HEAT-TRANSFER COEFFICIENT CALCULATED FROM EQ (21) OF REFERENCE 6	L FELTRU
CHFLUX	LESS THAN ZERO VALUE IMPLIES PRESENCE OF CHAR ELEMENTS IN SURFACE CHEMISTRY	L EQUIL
CHL	VALUE OF HEAT-TRANSFER COEFFICIENT CALCULATED USING LEWIS NUMBER CORRELATION (EQ (22) OF REFERENCE 6)	L FELTRU
CH(N)	CURVE FIT CONSTANTS FOR THERMODYNAMIC DATA (THE QUANTITY F2 + H298 DISCUSSED IN GROUP 12 OF INPUT INSTRUCTIONS) N=1 FOR LOW AND 2 FOR HIGH TEMPERATURE RANGE. IDENTICAL TO CCHH.	C EQPCOM
CIJ(K,KK)	GRAM ATOM OF ELEMENT K IN BASE SPECIES KK.	E EQPCOM
CK1(K)	CALCULATED IN ICOEFF	C COECON
CK6(K)	NORMALIZED ELEMENTAL MASS FLUX CALCULATED IN ICOEFF	C COECON
CK9(K)	DEFINED IN ICOEFF	C COECON
CK13(K)	DEFINED IN ICOEFF	C COECON
CK17(K)	DEFINED IN ICOEFF	C COECON
CK18(K)	DEFINED IN ICOEFF	C COECON
CK19(K)	DEFINED IN ICOEFF	C COECON
CK21(K)	DEFINED IN ICOEFF	C COECON
CK22(K)	DEFINED IN ICOEFF	C COECON
CK23(K)	DSQ(I-1) * DPHIKH(K) / 3.	L IONLY

CK24(K)	C7 * F(3,I) * CK23(K)	L IONLY
CK25(K)	DETA(I-1) * DUM1KK(K)	L IONLY
CK26(K)	C7 * F(2,I) * CK25(K)	L IONLY
CKK1(K,KK)	DEFINED IN ICOEFF	C COECON
CKK2(K,KK)	DEFINED IN ICOEFF	C COECON
CKK3(K,KK)	DEFINED IN ICOEFF	C COECON
CL	L (I) IN MIXING LENGTH FORMULATION.	C EPSCOM
CLNUM	CLAUSER NUMBER USED IN DEFINING EDDY VISCOSITY IN THE WAKE PORTION OF THE BOUNDARY LAYER.	C EPSCOM
CMCHL	RATIO CM(K) TO CHL	L FELTRU
CME(N)	AVERAGE OF THE CMK(N)	L FELTRU
CM(K)	ELEMENTAL MASS TRANSFER COEFFICIENTS BASED ON MASS FRACTION POTENTIAL, GIVEN BY VJKW(K)/(DUM(K)*WAT(K)) WHERE DUM(K) IS THE SUMMATION OVER KK OF (SP(I,NETA,KK) - SP(I,1,KK))/WTM(KK)*CIJ(K,KK)	L OUTPUT
CMF	THE FACTOR BY WHICH ALL CORRECTIONS ARE DAMPED DURING CHEMISTRY ITERATIONS.	L CRECT
CMFF(J)	THE VALUE OF CMF AFTER CONSIDERATION OF CONSTRAINTS ON THE CORRECTION TO BE APPLIED TO THE PARTIAL PRESSURE OF THE JTH SPECIES.	L CRECT
CMK(N)	ELEMENTAL MASS-TRANSFER COEFFICIENT CALCULATED BY EQ (16) OF REFERENCE 6	C EQTCOM
COEFQV(N)	GLOBAL SET OF COEFFICIENTS C5,C6,C7, ETC.	C COECOM
COEFQV(N)	GLOBAL SET OF COEFFICIENTS CK1,CK2, ETC.	E COECON
COND	THERMAL CONDUCTIVITY	L OUTPUT
CONE	CONE HALF-ANGLE FOR SPHERE-CONE SHAPED BODIES.	C PRMCOM
CONFQV	VARIABLE EQUIVALENCED TO COECON FOR DUMPING PURPOSES	L DUMCOM
CORAR(N)	CORRECTION ARRAY, COMPOSED OF CORRECTIONS IN H(I), I=1 TO NETA, AND SP(I,J,K), I=1,NETA, K=1,NSPM1.	E NONCOM
CORMA	THE VALUE OF THE MAXIMUM CORAR.	C RUNCOM
CP(J)	SPECIFIC HEAT.	C EQTCOM

CPA	LOCALLY DEFINED VARIABLE	L MATER
CPHAR(I)	FROZEN SPECIFIC HEAT OF THE MIXTURE.	C PRPCOM
CPF	FROZEN SPECIFIC HEAT. IDENTICAL TO CCPF*.	C EQTCOM
CPG	FROZEN SPECIFIC HEAT OF GAS. IDENTICAL TO CCPG*.	C EQTCOM
CPT	FROZEN SPECIFIC HEAT OF GAS.	L STATE
CPTIL	PROPERTY OF THE GAS MIXTURE WHICH REDUCES TO CPBAR FOR EQUAL DIFFUSION COEFFICIENTS, SEE EQ(28) OF NASA CR-1062.	C PRPCOM
CRHOV	VARIABLE EQUIVALENCED TO CRBCOM FOR DUMPING PURPOSES	L DUMCOM
CRHO(I-1)	C25 * DETA(I-1) * (1.-(RHOP(I)/RHO(I)) * DET\(I-1)/6)	C PRPCOM
CRHO1	(RHOP(I) / RHO(I)) * DETA(I-1) * (1.+DETA(I-1) * RHOP(I) / (RHO(I) * 6.))	L IONLY
CS(MS)	ENTROPY CORRESPONDING TO SF(MS)	C EDGCOM
CSPR(MS)	ENTROPY DERIVATIVE WITH RESPECT TO SF(MS)	C EDGCOM
CSP	EQUILIBRIUM SPECIFIC HEAT OF GAS.	L EQUIL
CT	COEFFICIENT APPEARING IN THE APPROXIMATION FOR THERMAL DIFFUSION COEFFICIENTS, SEE EQ(26) OF NASA CR-1062. NUMERICALLY EQUAL TO -0.5. SET EQUAL TO ZERO WHEN THERMAL DIFFUSION NEGLECTED.	C PRPCOM
CTR	CT * UNIVERS GAS CONSTANT.	C PRPCOM
CXM	LOCALLY DEFINED VARIABLE	L IONLY
CYM	LOCALLY DEFINED VARIABLE	L IONLY
CYSP	LOCALLY DEFINED VARIABLE	L IONLY
D	SET OF CONSTANT VECTORS CONVERTED TO SOLUTION VECTORS	L RERAY
D	ARGUMENT REPRESENTING DELTA ETA	L TAYLOR
D1	THE D SUB ONE OF EQ[89] IN NASA CR-1062.	L HISTXI
D2	THE D SUB TWO OF EQ[89] IN NASA CR-1062.	L HISTXI
D2UEDG	SECOND DERIVATIVE OF UEDGE WITH RESPECT TO STREAM FUNCTION, SEE EQ(68) OF NASA CR-1062 (SET EQUAL TO ZERO IN PRESENT PROGRAM).	C EDGCOM

DBAR	REFERENCE DIFFUSION COEFFICIENT INTRODUCED IN APPROXIMATION FOR UNEQUAL DIFFUSION COEFFICIENTS. NUMERICALLY EQUAL TO 4.16E-8 * T * SQRT(T) / (OMEGA * P).	L PROPS
DCAPCH	DERIVATIVE OF CAPC WITH RESPECT TO H.	C PRPCOM
DCAPCK(K)	DERIVATIVE OF CAPC WITH RESPECT TO MASS FRACTION OF ELEMENT K	C PRPCOM
DCLL	DERIVATIVE OF CL AT I WITH RESPECT TO CL AT I-1	L TRMBL
DCLPI	DERIVATIVE OF CL AT I WITH RESPECT TO PI AT I	L TRMBL
DCLPM	DERIVATIVE OF CL AT I WITH RESPECT TO PIM AT I-1	L TRMBL
DCPRH	DERIVATIVE OF CPBAR WITH RESPECT TO H, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DCPRK(K)	DERIVATIVE OF CPBAR WITH RESPECT TO MASS FRACTION OF ELEMENT K, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DCPTH	DERIVATIVE OF CPTIL WITH RESPECT TO H, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DCPTK(K)	DERIVATIVE OF CPTIL WITH RESPECT TO MASS FRACTION OF ELEMENT K, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DCU(I)	(DETA(I))**3	C ETACOM
DELJW(K)	ERROR IN DIFFUSIVE MASS FLUX, WALLJ(K), INTRODUCED DURING NEWTON-RAPHSON ITERATION.	C FLXCOM
DELQJW(N)	GLOBAL SET DELQW AND DELJW(K).	E FLXCOM
DELQW	ERROR IN DIFFUSIVE HEAT FLUX, WALLQ, INTRODUCED DURING NEWTON-RAPHSON ITERATION	C FLXCOM
DELST	DISPLACEMENT THICKNESS GIVEN BY Y(NETA)-C89*(F(1,NETA)-F(1,1))/ALPH.	C OUTCOM
DEPC	CONSTANT IN CORRECTION COEFFICIENTS ON EPSA(I) RESULTING FROM LINEAR CORRECTION COEFFICIENTS	C EPSCOM
DEPS(I)	DERIVATIVE OF EPSA(I) WITH RESPECT TO NONLINEAR VARIABLES	C EPSCOM
DER(L)	DIMENSIONED VARIABLE USED IN VARIOUS SUBROUTINES BUT NOT USED FOR TRANSMITTING INFORMATION BETWEEN SUBROUTINES.	C TEMCOM
DETA(I)	ETA(I+1) - ETA(I)	C ETACOM
DHTILH	DERIVATIVE OF HTIL WITH RESPECT TO H.	C PRPCOM

DHTILK(K)	DERIVATIVE OF HTIL WITH RESPECT TO MASS FRACTION OF ELEMENT K.	C PRPCOM
DTV	ROW NORMALIZING FACTOR IN GAUSSIAN ELIMINATION.	L RERAY
DTVC	PRODUCT OF 'DTV' AND ELEMENT OF ROW.	L RERAY
DKPT(MK)	DERIVATIVE OF LOG KP WITH RESPECT TO LOG TEMPERATURE.	C KINCOM
DLI(I)	DERIVATIVE OF EL(I) WITH RESPECT TO NONLINEAR VARIABLES	C EPSCOM
DLPH	A(3,I) EVALUATED AT THE WALL.	C NONCOM
DLPK(K)	A(3,K+2) EVALUATED AT THE WALL.	C NONCOM
DLXI	ALOG(XI(I) / XI(L-1))	L HISTXI
DLX2	STORED (HISTORIC) VALUE FOR DLOGXI DEFINED BY EQ(90) OF NASA CR-1062.	C HISCOM
DMU12H	DERIVATIVE OF VMU12 WITH RESPECT TO H, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DMU12K(K)	DERIVATIVE OF VMU12 WITH RESPECT TO MASS FRACTION OF ELEMENT K. SET EQUAL TO ZERO IN PRESENT PROGRAM.	C PRPCOM
DMU3H	DERIVATIVE OF VMU3 WITH RESPECT TO H.	C PRPCOM
DMU3K(K)	DERIVATIVE OF VMU3 WITH RESPECT TO MASS FRACTION OF ELEMENT K.	C PRPCOM
DMU4H	DERIVATIVE WITH RESPECT TO H OF THE COEFFICIENT MU4 DEFINED IN EQ(28) OF NASA CR-1062.	C PRPCOM
DMU4K(K)	DERIVATIVE WITH RESPECT TO MASS FRACTION OF ELEMENT K OF THE COEFFICIENT MU4 DEFINED IN EQ(28) OF NASA CR-1062.	C PRPCOM
DPHIKH(K)	DERIVATIVE OF PHIK WITH RESPECT TO H, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DPHIKK(K,KK)	DERIVATIVE OF K TH PHIK WITH RESPECT TO MASS FRACTION OF ELEMENT KK. SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DPI(3+K,2)	(ARRAY OF DERIVATIVES OF PI WITH RESPECT TO PRIMARY VARIABLES)/TREF	C EPSCOM
DPRH	DERIVATIVE OF PR WITH RESPECT TO H, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DPRK(K)	DERIVATIVE OF PR WITH RESPECT TO MASS FRACTION OF ELEMENT K. SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DQJNL(N)	GLOBAL SET OF DQNL AND DJNL(K).	E FLXCOM

DQJRNL(N)	DERIVATIVE OF DIFFUSIVE HEAT AND MASS FLUXES, WALLQJ WITH RESPECT TO NTH REDUCED NONLINEAR VARIABLE.	E NONCOM
DQNL(N)	DERIVATIVE OF DIFFUSIVE HEAT FLUX, WALLQ, WITH RESPECT TO N TH NONLINEAR VARIABLE.	C FLXCOM
DQRH	DERIVATIVE OF QR WITH RESPECT TO H, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DQRK(K)	DERIVATIVE OF QR WITH RESPECT TO MASS FRACTION OF ELEMENT K, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DRHOH	DERIVATIVE OF RHO WITH RESPECT TO H.	C PRPCOM
DRHOI	DERIVATIVE OF VELOCITY DEFECT THICKNESS WITH RESPECT TO RHO AT I	L TRMBL
DRHOK(K)	DERIVATIVE OF RHO WITH RESPECT TO MASS FRACTION OF ELEMENT K.	C PRPCOM
DRNL(N)	REDUCED NONLINEAR ERRORS BEFORE MATRIX INVERSION, CORRECTIONS OF VARIABLES IN REDUCED NONLINEAR SET AFTER MATRIX INVERSION.	C ERRCOM
DSCH	DERIVATIVE OF SC WITH RESPECT TO H, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DSCK(K)	DERIVATIVE OF SC WITH RESPECT TO MASS FRACTION OF ELEMENT K, SET EQUAL TO ZERO IN CURRENT PROGRAM.	C PRPCOM
DSIP(L)	DECREASE IN ENTROPY FROM PREVIOUS STATION TO CURRENT STATION L AT BOUNDARY LAYER EDGE DUE TO SHOCK CURVATURE (DSIP(1) = 0 BY DEFINITION).	C EDGCOM
DSQ(I)	(DETA(I))**2	C ETACOM
DSV	LOCALLY DEFINED VARIABLE	L MATS1
DTD	DOWNWARD TEMPERATURE STEP USED IN SEEKING SURFACE EQUILIBRIUM SOLUTION.	L EQUIL
DTEMP	PREDICTED CHANGE IN SURFACE TEMPERATURE FOR THE CURRENT ITERATION DURING A KR(9) = 6 PROBLEM.	L NONCER
DTH	DERIVATIVE OF T WITH RESPECT TO H.	C PRPCOM
DTHW	DTH EVALUATED AT THE WALL.	C NONCOM
DTK(K)	DERIVATIVE OF T WITH RESPECT TO MASS FRACTION OF ELEMENT K	C PRPCOM
DTKW(K)	DTK EVALUATED AT THE WALL.	C NONCOM
DTM	LIMIT VALUE OF DELTA (1./T) IN CHEMISTRY SOLUTION.	L CRECT

DTU	UPWARD TEMPERATURE STEP USED IN SEEKING SURFACE EQUILIBRIUM SOLUTION.	L EQUIL
DUB2	-	L INPUT
DUB3	LOCALLY INPUT VARIABLES, IF NON-ZERO ASSIGNED TO FITMOL,	L INPUT
DUB4	BASMOL, SIGMA AND EPOVRK, RESPECTIVELY	L INPUT
DUB5	-	L INPUT
DUDS(L)	DERIVATIVE OF EDGE VELOCITY WITH RESPECT TO S IN REFCON, TEMPORARY STORAGE AREA IN OTHER ROUTINES.	C TEMCOM
DUEDGE	DERIVATIVE UEDGE WITH RESPECT TO STREAM FUNCTION, SEE EQ (69) OF NASA CR-1062 (SET EQUAL TO ZERO IN PRESENT PROG).	C EDGCOM
DUES	DERIVATIVE OF EDGE VELOCITY WITH RESPECT TO STREAMWISE COORDINATE S.	C EDGCOM
DUM	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM1	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM2	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM3	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM4	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM5	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM6	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM7	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUM8	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
DUMP	P * 10**7, LIMIT PRESSURE IN CONTROLLING DAMPING OF CHEMISTRY SOLUTION.	L CRECT
DU7	LOCALLY DEFINED VARIABLE	L OUTPUT
DVNL(N)	DAMPED NONLINEAR CORRECTIONS (GIVEN BY EQ(156) OF NASA CR-1062 MULTIPLIED BY EASE).	C NONCOM
DVS	VELOCITY DEFECT THICKNESS OVER DEL.	C EPSCOM
DY(J)	CORRECTION ON VARIABLE Y(J)* IN CHEMISTRY SOLUTION.	C EQTCOM
DYT	DAMPED CORRECTION ON VARIABLE Y(J)* IN CHEMISTRY SOLUTION.	L CRECT
DZ	THE D SUB ZERO OF EQ(89) IN NASA CR-1062.	L HISTXI

DZKH(K)	DERIVATIVE OF ZK WITH RESPECT TO H.	C PRPCOM
DZKK(K,KK)	DERIVATIVE OF K TH ZK WITH WITH RESPECT TO MASS FRACTION OF ELEMENT KK.	C PRPCOM
E(N)	ERRORS IN CHEMISTRY EQUATIONS (MASS BALANCE ERRORS FOR N EQUAL TO OR LESS THAN IS*. EQUILIBRIUM ERRORS FOR N GREATER THAN IS*. WHERE IS* IS NUMBER OF ELEMENTS INCLUDING ELECTRON).	C EQTCOM
EAR	ABSOLUTE VALUE OF EQUILIBRIUM ERROR FOR A SPECIES IN CHEMISTRY SOLUTION.	L MATER
EAK(MK)	ACTIVATION ENERGY.	C KINCOM
EASE	DAMPING FACTOR, APPLIED UNIFORMLY TO ALL CORRECTIONS.	C BUMCOM
EB(K)	MAGNITUDE OF LARGEST CONTRIBUTION TO K TH MASS BALANCE.	C EQTCOM
EBL(K)	MINIMUM CONTRIBUTION ACCEPTED TO K TH MASS BALANCE, =EB/(10**8)	C EQTCOM
ECD(N)	RESIDUAL ERROR IN CONDENSED EQUILIBRIUM IMPOSED IN CHEMISTRY SOLUTION AS A CONSEQUENCE OF BOUNDARY LAYER DAMPING.	L MATER
ECRP	LIMIT CHANGE OF CONDENSED SPECIES QUANTITIES DURING CHEMISTRY ITERATION.	C EQTCOM
ECRT	NOT CURRENTLY USED.	C EQTCOM
EDGEOV	VARIABLE EQUIVALENCED TO EDGCOM FOR DUMPING PURPOSES	L DUMCOM
EER	EQUILIBRIUM ERROR OF CONDENSED SPECIES BEING INTRODUCED DURING CURRENT ITERATION.	L MATER
EESE(N)	RESIDUAL ERROR IN MASS BALANCE IMPOSED IN CHEMISTRY SOLUTION AS A CONSEQUENCE OF BOUNDARY LAYER DAMPING.	L MATER
EG2	CONTRIBUTION TO THERMAL FLUX DUE TO INEQUALITY OF TURBULENT PRANDTL AND SCHMIDT NUMBERS	L TRMBL
EG3	CONTRIBUTION TO THERMAL FLUX DUE TO TURBULENT VISCOUS DISSIPATION	L TRMBL
EHS	ERROR IN ENTHALPY OR ENTROPY FOR ASSIGNED ENTHALPY OR ENTROPY CHEMISTRY SOLUTIONS.	L MATER
EL	MAXIMUM EQUILIBRIUM ERROR, IDENTICAL TO EEL*.	C EQTCOM
EL(I)	MIXING LENGTH NORMALIZED BY DEL.	C EPSCOM
ELCON	MIXING LENGTH CONSTANT AS IN L = ELCON*Y.	C EPSCOM

ELK	LOG OF EQUILIBRIUM IMBALANCE OF KINETIC REACTION.	L KINET
ELKM	LOG OF NON-EQUILIBRIUM OF KINETIC RELATION	L KINET
ELM(N)	GLOBAL SET OF MAXIMUM VALUES OF ERRORS FOR VARIOUS SETS OF TAYLOR SERIES EXPANSIONS.	C ERRCOM
ELMM	MAXIMUM VALUE OF ELM(N).	C ERRCOM
EMIS	SURFACE EMITTANCE OF THE MATERIAL BEING CONSIDERED UNDER KR(9) = 3,4,5 OR 6.	C CRBCOM
EMISC	SURFACE EMITTANCE OF THE MATERIAL BEING CONSIDERED UNDER KR(9) = 3 OR 4.	C CRBCOM
EMIST	SURFACE EMITTANCE OF THE MATERIAL BEING CONSIDERED UNDER KR(9) = 5 OR 6.	C CRBCOM
EMIV	SURFACE EMISSIVITY	C CRBCOM
ENL	MAXIMUM MASS BALANCE ERROR. IDENTICAL TO EENL+.	C EQTCOM
ENL(N)	GLOBAL SET OF ERRORS FOR LINEARIZED CONSERVATION EQUATIONS AND BOUNDARY CONDITIONS.	C ERRCOM
ENLM(N)	GLOBAL SET OF MAXIMUM VALUES OF ERRORS FOR THE VARIOUS SETS OF LINEARIZED CONSERVATION EQUATIONS AND BOUNDARY CONDITIONS.	C ERRCOM
ENLMM	LARGEST VALUE OF ENLM.	C ERRCOM
EOL	MULTIPLYING FACTOR USED TO SMOOTHLY TRANSFORM KINETIC MASS BALANCE TO EQUIVALENT EQUILIBRIUM EQUATION.	L KINET
EP	ERROR IN OVERALL PRESSURE BALANCE.	L MATER
EPSA(I)	RHO(I)**2*(EDDY VISCOSITY)/(RHOE(L)*VMUE(L)).	C EPSCOM
EPT	LOCALLY DEFINED VARIABLE	L TRMBL
EPOVRK	EPSILON/K. OF REFERENCE SPECIES IN DIFFUSION CALCULATIONS	C EQTCOM
EPS	KINEMATIC EDDY VISCOSITY	L TRMBL
EPS1	KINEMATIC EDDY VISCOSITY IN WALL REGION	C EPSCOM
EPS2	KINEMATIC EDDY VISCOSITY IN WAKE REGION	L TRMBL
EPSOUT	VARIABLE EQUIVALENCED TO EPSCOM FOR OUTPUT PURPOSES	L TRMBL
EQPEQV	VARIABLE EQUIVALENCED TO EQPCOM FOR DUMPING PURPOSES	L DUMCOM
EQTEQV	VARIABLE EQUIVALENCED TO EQTCOM FOR DUMPING PURPOSES	L DUMCOM

EP	ERROR IN MASS BALANCE RELATION.	L MATER
ERPP1	DERIVATIVE OF DAWSON FUNCTION WITH RESPECT TO ITS ARGUMENT AT I	L TRMBL
ERPP2	DERIVATIVE OF DAWSON FUNCTION WITH RESPECT TO ITS ARGUMENT AT I-1	L TRMBL
ERP1	DAWSON FUNCTION OF ARGUMENT AT I	L TRMBL
EPP2	DAWSON FUNCTION OF ARGUMENT AT I-1	L TRMBL
ERREQV	VARIABLE EQUIVALENCED TO ERRCOM FOR DUMPING PURPOSES	L DUMCOM
ETA(I)	TRANSFORMED COORDINATE IN A DIRECTION NORMAL TO THE SURFACE DEFINED BY EQ (33) OF NASA CR-1062.	C ETACOM
ETAEQV	VARIABLE EQUIVALENCED TO ETACOM FOR DUMPING PURPOSES	L DUMCOM
ETAT	LOCALLY DEFINED VARIABLE	L FIRSTG
EXEL	RATIO OF FORWARD TO REVERSE DRIVING POTENTIAL IN KINETIC EQUATIONS.	L KINET
EXK(MK)	ALWAYS SET TO 1.0, (REACTION EXPONENT).	C KINCOM
F(N,I)	STREAM FUNCTION (N=1), VELOCITY RATIO (N=2) AND DERIVATIVES OF ORDER N-2 OF VELOCITY RATIO WITH RESPECT TO ETA.	C VARCOM
FAMOA(J)	ALPHANUMERIC VARIABLE, FIRST OF TWO PORTIONS OF SPECIES NAME. IDENTICAL TO MOA*.	C BLQCOM
FAMOB(J)	ALPHANUMERIC VARIABLE, SECOND OF TWO PORTIONS OF SPECIES NAME. IDENTICAL TO MOB*.	C BLQCOM
FD(N)	D1 * F(N+1,I) + D2 * HF(I,N+1) FOR N=1 THROUGH 3, D1 * F(4,I-1)+D2 * HF(I-1,4) FOR N=4.	L HISTXI
FF(J)	DIFFUSION FACTOR INTRODUCED BY THE APPROXIMATION FOR DIFFUSION COEFFICIENTS BY EQ(19) OF NASA CR-1062.	C EQPCOM
FFA	POWER ON MOLECULAR WEIGHT IF IT IS ASSUMED THAT THE DIFFUSION FACTORS, FF(J), ARE PROPORTIONAL TO SPECIES MOLECULAR WEIGHTS, WTM(J), RAISED TO A POWER.	C EQPCOM
FFAR	POWER ON MOLECULAR WEIGHT READ IN IF IT IS ASSUMED THAT THE DIFFUSION FACTORS, FF(J), ARE PROPORTIONAL TO SPECIES MOLECULAR WEIGHTS, WTM(J), RAISED TO A POWER OTHER THAN 0.5.	L INPUT
FFF	RATIO OF GAS MOLECULAR WEIGHT TO 'VMU2'.	L MATER
FFIN(J)	DIFFUSION FACTOR, FF(J), WHICH IS READ IN.	L INPUT

FFK2	PARAMETER SET EQUAL TO WM/VMU2 FOR EQUAL DIFFUSION COEFFICIENTS (KKR(14)=2) AND TO FF(K) FOR UNEQUAL DIFFUSION COEFFICIENTS (KKR(14)=0 OR 1).	L PROPS
FITMOL	CONSTANT IN CURVE FIT OF DIFFUSION FACTORS BASED ON MOLECULAR WEIGHTS	L INPUT
FKF(MK)	PRE-EXPONENTIAL FACTOR,POUND MOLES OF REACTANT PER SECOND PER FT**2.	C KINCOM
FLD(N,NN)	CURVE FIT CONSTANT; FOR THERMODYNAMIC DATA FOR THE FLUID MIXTURE IN KR(7)=1 OPTION (SIMILAR TO THE QUANTITIES DISCUSSED IN GROUP 12 OF THE INPUT INSTRUCTIONS). NN= 1,2 OR 3 FOR TEMPERATURE RANGES LESS THAN 3600 DEG R, EQUAL TO OR GREATER THAN 3600 DEG R BUT LESS THAN 5400 DEG R, OR, EQUAL TO OR GREATER THAN 5400 DEG R, RESPECTIVELY. N REFERS TO COMPONENT OF THE NONREACTING FLUID MIXTURE.	C STTCOM
FLE(N)	ERROR FOR THE TAYLOR SERIES EXPANSIONS INVOLVING F(I,I) AND THEIR DERIVATIVES.	C ERRCOM
FLEM	MAXIMUM VALUE OF FLE(N).	C ERRCOM
FLIQ	FRACTION OF A SPECIES WHICH IS LIQUID.	C EQTCOM
FLPEQV	VARIABLE EQUIVALENCED TO FEPCOM FOR DUMPING PURPOSES	L DUMCOM
FLUXJ(N,L,1)	CONVERGED VALUE FOR MASS FLUX OF COMPONENT N INTO THE BOUNDARY LAYER AT THE WALL. N = 1 TO 3 FOR EDGE GAS, PYROLYSIS GAS AND CHAR, RESPECTIVELY.	C WALCOM
FLXEQV	VARIABLE EQUIVALENCED TO FLXCOM FOR DUMPING PURPOSES	L DUMCOM
FM(J)	3 IF UNIMPORTANT SPECIES (NOT SIGNIFICANT IN ANY MASS BALANCE). OTHERWISE 1.	C EQTCOM
FN	LOCALLY DEFINED VARIABLE	L ERP
FNLFM	ERROR FOR THE LINEARIZED MOMENTUM EQUATIONS AND BOUNDARY CONDITIONS.	C ERRCOM
FNU(K)	VNU(J,K) FOR CURRENT J.	C EQTCOM
FPPW	F(3,1) PRINTED IN ONE-LINE-PER-ITERATION OUTPUT.	L ITERAT
FR(J,I)	MOLE FRACTION.	C BLQCOM
FW(L,1)	CONVERGED VALUE OF STREAM FUNCTION AT SURFACE OF BODY.	C WALCOM
FWCON(L)	INTEGRAND IN CALCULATION OF FW IN REFCON. TEMPORARY STORAGE AREA IN OTHER ROUTINES.	C TEMCOM

FWDUM(L)	FW * SQRT(2*XI) IN REFCON. TEMPORARY STORAGE AREA IN OTHER ROUTINES.	C TEMCOM
G(N,I)	TOTAL ENTHALPY (N=1) AND ITS DERIVATIVES OF ORDER N-1 WITH RESPECT TO ETA.	C VARCOM
GAM	ISENTROPIC EXPONENT.	L EQUIL
GAM(N)	PARAMETER GAMMA APPEARING IMPLICITYLY IN EQ (17) OF REF. 6	L FELTRU
GAMI	ISENTROPIC EXPONENT FOR HOMOGENEOUS MIXTURE	C STTCOM
GAMF(K)	DEFINED BY EQ(79) OF NASA CR-1064.	C EQTCOM
GAMH(K)	DEFINED BY EQ(80) OF NASA CR-1064.	C EQTCOM
GAMK(K,KK)	DEFINED BY EQ(81) OF NASA CR-1064.	E NONCOM
GD(N)	D1 * G(N,I) + D2 * HG(I,N) FOR N=1 THROUGH 3, D1 * G(3, I-1) + D2 * HG(I-1,3) FOR N=4.	L HISTXI
GE(M)	STAGNATION ENTHALPY AT BOUNDARY LAYER EDGE.	C PRMCOM
GEP	DERIVATIVE OF TOTAL ENTHALPY AT BOUNDARY-LAYER EDGE WITH RESPECT TO ETA	
GLE(N)	ERROR FOR THE TAYLOR SERIES EXPANSIONS INVOLVING G(1,I) AND THEIR DERIVATIVES.	C ERRCOM
GLEM	MAXIMUM VALUE OF GLE(N).	C ERRCOM
GMR	ISENTROPIC EXPONENT FROM EQUILIBRIUM CALCULATION	C PRPCOM
GNLEM	ERROR FOR THE LINEARIZED ENERGY CONSERVATION EQUATIONS.	C ERRCOM
GPADRO	NORMAL-TO-PITCH-PLANE STAGNATION-POINT VELOCITY GRADIENT RATIO	C PRMCOM
GW	FIRST GUESS FOR WALL ENTHALPY WHICH IS READ IN WHEN KR(2)=0	L FIRSTG
H(I)	STATIC ENTHALPY OF THE MIXTURE. IDENTICAL TO HH*.	C PRPCOM
H(J)	ENTHALPY. IDENTICAL TO HH*.	C EQTCOM
HALPH	STORED (HISTORIC) VALUE OF ALPH ONE STATION UPSTREAM.	C HISCOM
HCARB	HEAT OF FORMATION AT 298 DEG. K OF THE SURFACE MATERIAL BEING CONSIDERED UNDER KR(9) = 3 OR 4.	C CRBCOM
HCH	CHAMBER (OR STAGNATION) ENTHALPY	L EQUIL
HCHAR	CHAR ENTHALPY	C CRBCOM

HCWAL	ENTHALPY OF SURFACE SPECIES DURING KR(9) = 3 OR 4 OPTIONS.	C EQPCOM
HF	STATIC ENTHALPY OF GAS AT BOUNDARY-LAYER EDGE.	C EDGCOM
HFA(L)	STATIC ENTHALPY DISTRIBUTION AT BOUNDARY-LAYER EDGE	C EDGCOM
HFT	TOTAL ENTHALPY OF GAS AT BOUNDARY-LAYER EDGE.	L STATE
HF(I,N)	STORED (HISTORIC) VALUE OF F(N,I) ONE STATION UPSTREAM FOR N=1 THROUGH 4. HF(I,5) = D1*F(1,I) + D2*HF(I,1) WHERE D1 AND D2 ARE DEFINED BY EQ(88) OR (89) OF NASA CR-1062.	C HISCOM
HG	ENTHALPY OF GAS, IDENTICAL TO HHG*.	C EQTCOM
HG(I,N)	STORED (HISTORIC) VALUE OF G(N,I) ONE STATION UPSTREAM.	C HISCOM
HH(I)	STATIC ENTHALPY OF THE MIXTURE, IDENTICAL TO H*.	C PRPCOM
HH(J)	ENTHALPY, INDENTICAL TO H(J)*.	C EQTCOM
HINF	FREE-STREAM STATIC ENTHALPY	C EDGCOM
HIP	ENTHALPY INPUT.	C EQTCOM
HISEQV	VARIABLE EQUIVALENCED TO HISCOM FOR DUMPING PURPOSES	L DUMCOM
HIST1(N)	SET OF VARIABLES STARTING WITH XI(1) TO BE STORED ON TAPE.	E HISCOM
HIST2(N)	SET OF VARIABLES STARTING WITH PE(1,1) TO BE STORED ON TAPE	E EDGCOM
HIST3(N)	SET OF VARIABLES STARTING WITH F(1,1) TO BE STORED ON TAPE	E VARCOM
HIST4(N)	SET OF VARIABLES STARTING WITH FW(1,1) TO BE STORED ON TAPE	E WALCOM
HM(J)	ENTHALPY OF FUSION.	C EQPCOM
HMAT	HEAT OF FORMATION AT 298 DEG. K OF THE MATERIAL BEING CONSIDERED UNDER KR(9) = 3,4,5 OR 6.	C CRBCOM
HMELT	HM(J) IF J TH SPECIES IS CHANGING PHASE, OTHERWISE 0.	C EQTCOM
HOS	ENTHALPY OR ENTROPY OF SPECIES IN ASSIGNED ENTHALPY OR ENTROPY CHEMISTRY SOLUTION.	L WATER
HP	DERIVATIVE OF H WITH RESPECT TO ETA.	C PRPCOM
HPG	HEAT OF FORMATION AT 298 DEG. K OF THE PYROLYSIS GAS BEING CONSIDERED UNDER KR(9) = 3 OR 4.	C CRBCOM
HPYG	PYROLYSIS GAS ENTHALPY	C CRBCOM

HSP(I,N,K)	STORED (HISTORIC) VALUE OF SP(N,I,K) ONE STATION UPSTREAM.	C HISCOM
HTEF	HEAT OF FORMATION AT 298 DEG. K OF THE MATERIAL BEING CONSIDERED UNDER KR(9) = 5 OR 6.	C CRBCOM
HTIL	PROPERTY OF THE GAS MIXTURE WHICH REDUCES TO H(I) FOR EQUAL DIFFUSION COEFFICIENTS. SEE EQ(2A) OF NASA CR-1062.	C PRPCOM
HTILP	DERIVATIVE OF HTIL WITH RESPECT TO ETA.	C PRPCOM
HW(L,1)	CONVERGED ENTHALPY OF GAS AT THE WALL.	C WALCOM
I	INDEX ON ETA. I=1 AT WALL. IDENTICAL TO II*.	
II	LOCAL INDEX	L KINET
I777	VARIABLE TO CHECK IF SUBROUTINE HAS PREVIOUSLY BEEN ENTERED	C BUMCOM
IAST	ASSIGNED THE VALUE COMMA (,) THROUGH A DATA STATEMENT FOR USE IN TEST OF WHETHER THERE IS TO BE ANOTHER CASE.	L BLIMP
IB(K)	INDEX ON SPECIES WITH LARGEST CONTRIBUTION TO K TH MASS BALANCE. SUBSEQUENTLY ORDERED ON IB WITH DUPLICATES SET TO 1000.	C EQTCOM
IBLANK	ASSIGNED THE VALUE BLANK ( ) THROUGH A DATA STATEMENT FOR USE IN TEST OF WHETHER THERE IS TO BE ANY PUNCHED CARD OUTPUT.	L OUTPUT
IC(K)	NEGATIVE INDEX OF ELEMENT CORRESPONDING TO KTH BASE SPECIES	L INPUT
ICORA	INDEX CORRESPONDING TO CORMA IN THE CORAR ARRAY.	C BUMCOM
ICT	CYCLE COUNTER ON POST INVERSION MODIFICATION IN CHEMISTRY SOLUTION	L EQUIL
IDENT	ALPHANUMERIC IDENTIFICATION SYMBOL APPEARING ON PUNCHED CARD DATA (NO CARDS PUNCHED IF IDENT IS INPUT AS A BLANK).	C INTCOM
IDISC(L)	CONTROL VARIABLE FOR DISCONTINUITY (1 IF DISCONTINUITY, OTHERWISE 0).	C PRMCOM
IDSIP	ITEM WHEN DSIP IS TO BE UPDATED.	C EDGCOM
IDUM	LOCALLY DEFINED VARIABLE	L SETUP
IE	EQUATION INDEX FOR CONDENSED SPECIES.	L MATER
IEMAX	INDICIES ON MAXIMUM NON-LINEAR ERRORS FOR EACH SET OF CONSERVATION EQUATIONS	L NONCER
IEMAX	INDICIES OF MAXIMUM NON-LINEAR ERRORS FOR EACH SET OF CONSERVATION EQUATIONS	L NONCER

IFR	EQUATION NUMBER TO REPRESENT NEWLY APPEARING CONDENSED SPECIES.	C	EQTCOM
IFC(J)	CONTROL FLAG (0 GAS, -1 NONPRESENT CONDENSED, +1 PRESENT CONDENSED. PRIOR FLAGS DECREMENTED BY 2 IF SPECIES CONTAINS NONPRESENT ELEMENT OR INCREMENTED BY 3 IF IT IS A BASE SPECIES REPRESENTING A NONPRESENT ELEMENT).	C	EQPCOM
IFLM	INDEX OF THE SET OF LINEAR EQUATIONS WHICH HAS THE LARGEST ERROR FLEM.	C	ERRCOM
IFLUXJ	ITEM WHEN FLUXJ IS TO BE UPDATED.	C	WALCOM
IFN	INDEX ON LINEAR VARIABLE F(1,I)	L	IMONE
IFN	INDEX ON LINEAR VARIABLE F(1,I)	L	IONLY
IFNLM	INDEX OF THE LINEARIZED MOMENTUM EQUATION WHICH HAS THE LARGEST ERROR FNLEM.	C	ERRCOM
IFP	INDEX ON NON-LINEAR VARIABLE F(2,I)	L	IMONE
IFP	INDEX ON NON-LINEAR VARIABLE F(2,I)	L	IONLY
IFPP	INDEX ON LINEAR VARIABLE F(3,I)	L	IMONE
IFPP	INDEX ON LINEAR VARIABLE F(3,I)	L	IONLY
IFPPP	INDEX ON LINEAR VARIABLE F(4,I)	L	IMONE
IFPPP	INDEX ON LINEAR VARIABLE F(4,I)	L	IONLY
IFW	ITEM WHEN FW IS TO BE UPDATED.	C	WALCOM
IG	NOMINALLY ZERO, EQUALS ONE ON FIRST SET OF BOUNDARY LAYER CHEMISTRY SOLUTIONS. FIRST GUESS AT I+ IS SOLUTION AT I-IG.	L	EQUIL
IG	ELIMINATION INDEX IN BASE SPECIES-ELEMENT CORRESPONDENCE LOGIC.	L	INPUT
IGLM	INDEX OF THE SET OF LINEAR EQUATIONS WHICH HAS THE LARGEST ERROR GLEM.	C	ERRCOM
IGNLM	INDEX OF THE LINEARIZED ENERGY CONSERVATION EQUATION WHICH HAS THE LARGEST ERROR GNLEM.	C	ERRCOM
IHW	ITEM WHEN HW IS TO BE UPDATED.	C	WALCOM
IT	INDEX ON ETA, IT=1 AT WALL, IDENTICAL TO I+.	C	INTCOM
ITS	LOCAL INDEX	L	RECASE

IJ	LOCAL INDEX	L PROPS
IK	LOCAL INDEX	L PROPS
IL	INDEX ON FIRST CHEMISTRY EQUATION TO BE SOLVED (1 FOR UNKNOWN T AND 2 FOR KNOWN T).	C EQTCOM
ILMM	INDEX OF THE LINEAR EQUATION WHICH HAS THE LARGEST ERROR FLMM.	C ERRCOM
IM(K)	ROW AND COLUMN INDEX IN INVERSION OF CIJ TO UM.	L INPUT
IMI	LOCAL INDEX	L INPUT
IMJ	LOCAL INDEX	L INPUT
IML	LOCAL INDEX	L INPUT
IN	NUMBER OF EQUATIONS BEING SOLVED (HAS THE VALUE OF THE LOCAL VARIABLE ISPQ IF TEMPERATURE IS UNKNOWN OR ISPQ-1 IF TEMPERATURE IS KNOWN).	C EQTCOM
INLMM	INDEX OF THE NONLINEAR EQUATION WHICH HAS THE LARGEST ERROR FNLMM.	C ERRCOM
INP	IN+2	L CRECT
IPRF	ITEM WHEN PRE IS TO BE UPDATED.	C PRMCOM
INTEQV	VARIABLE EQUIVALENCED TO INTCOM (EXCEPT KR(20)) FOR DUMPING PURPOSES	L DUMCOM
INV	FLAG ON RESTART OF CHEMISTRY (PERMITS ONLY ONE RESTART)	L EQUIL
IQ	FOR EACH NON-BASE GASEOUS SPECIES INITIALIZED TO ZERO, SET TO ONE IF SPECIES IS SIGNIFICANT IN ANY MASS BALANCE.	L MATER
IQQ	DEBUG(-2) AND NONCONVERGENT(-1) FLAG ON CALL TO AND RETURN FROM RERAY, RESPECTIVELY.	L EQUIL
IR(K)	CORRESPONDENCE VECTOR BETWEEN BASE SPECIES AND ELEMENTS.	C EQPCOM
IRAD	ITEM WHEN RADP IS TO BE UPDATED.	C PRMCOM
IRE	INDEX ON NEWLY APPEARING CONDENSED SPECIES.	C EQTCOM
IRHOVW	ITEM WHEN RHOVW IS TO BE UPDATED.	C WALCOM
IS	NUMBER OF ELEMENTS INCLUDING ELECTRON, IDENTICAL TO IZ+.	C EQPCOM
IS	INDEX ON S, IS=1 AT STAGNATION POINT OR LEADING EDGE, IDENTICAL TO ISS*.	C INTCOM

ISH	VALUE OF IS AT PREVIOUS STREAMWISE STATION AT WHICH A BOUNDARY-LAYER SOLUTION HAS BEEN OBTAINED	C INTCOM
ISM	NSP-1	L PROPS
ISP	NUMBER OF ELEMENTS INCLUDING ELECTRON PLUS ONE.	C BUMCOM
ISP	SAME AS ISP IN INPUT.	L EQUIL
ISP	(IS*) + 1 WHERE IS* IS THE NUMBER OF ELEMENTS INCLUDING ELECTRONS.	L INPUT
ISP	NSP + 1	L PROPS
ISP2	NUMBER OF ELEMENTS INCLUDING ELECTRON PLUS TWO.	C KINCOM
ISP2	NSP + 2	L PROPS
ISPLM(K)	INDEX OF THE SET OF LINEAR EQUATIONS WHICH HAS THE LARGEST ERROR SPLEM(K).	C ERRCOM
ISPN	INDEX ON NON-LINEAR VARIABLE (G(1,I) OR SP(1,I,K))	L IMONE
ISPN	INDEX ON NON-LINEAR VARIABLE (G(1,I) OR SP(1,I,K))	L IONLY
ISPNLM(K)	INDEX OF THE LINEARIZED ELEMENTAL CONSERVATION EQUATION WHICH HAS THE LARGEST ERROR SPNLEM(K).	C ERRCOM
ISPP	INDEX ON LINEAR VARIABLE (G(2,I) OR SP(2,I,K))	L IMONE
ISPP	INDEX ON LINEAR VARIABLE (G(2,I) OR SP(2,I,K))	L IONLY
ISPPP	INDEX ON LINEAR VARIABLE (G(3,I) OR SP (3,I,K))	L IMONE
ISPI	INDEX ON LINEAR VARIABLE (G(3,I) OR SP (3,I,K))	L IONLY
ISPO	ISP2 + NUMBER OF PRESENT CONDENSED SPECIES.	C KINCOM
ISPO	NUMBER OF EQUATIONS SOLVED IN CHEMISTRY SOLUTIONS, IS+2+ NUMBER OF PRESENT CONDENSED SPECIES.	L EQUIL
ISPW	ITEM WHEN SPW IS TO BE UPDATED.	C WALCOM
ISS	INDEX ON S, ISS=1 AT STAGNATION POINT OR LEADING EDGE, IDENTICAL TO IS+.	C INTCOM
IST	LOCAL INDEX	L FIRSTG
ISU	INDEX OF SPECIES REPRESENTATIVE OF SURFACE	C CRBCON
ISV	ISV IS SET EQUAL TO IS* NEAR BEGINNING OF SUBROUTINE PROPS IS* THEN BEING SET TO NSP. IS* RESTORED TO ISV AT THE END OF PROPS.	L PROPS

ISV2	LOCALLY DEFINED VARIABLE	L PROPS
ISVP	ISV+1	L PROPS
IT	NOT USED IN CURRENT VERSION, IDENTICAL TO IIT*.	C EQTCOM
IT	CURRENTLY SET TO UNITY, IDENTICAL TO ITT*.	C INTCOM
ITEM	TIME (OR SUBCASE).	C INTCOM
ITFF	NEGATIVE COUNT ON SUCCEEDING CHEMISTRY SOLUTIONS WHICH WILL ACCEPT RESIDENT SOLUTION AS FIRST GUESS.	L EQUIL
ITS	COUNTER FOR CHEMISTRY ITERATIONS, IDENTICAL TO IITS*.	C EQTCOM
ITS	COUNTER FOR BOUNDARY LAYER ITERATIONS, IDENTICAL TO MITS*.	C INTCOM
ITT	CURRENTLY SET TO UNITY, IDENTICAL TO IT*.	C INTCOM
ITW	ITEM WHEN TW IS TO BE UPDATED.	C WALCOM
IU	COUNTER ON NUMBER OF STREAMWISE STATIONS AT WHICH BOUNDARY LAYER SOLUTIONS HAVE BEEN OBTAINED	C INTCOM
IX	VARIABLE IN RERAY CALL SEQUENCE HAVING TO DO WITH PRINTING OF DEBUG OUTPUT, -2 GIVES DEBUG, COMES BACK 3 IF INVERSION SUCCEEDED, 1 IF SINGULAR.	C BUMCOM
IX	DIAGNOSTIC FLAG PREVIOUSLY USED TO INDICATE TYPE OF BAD INPUT DETECTED.	L INPUT
IX	DEBUG FLAG.	L RERAY
IZ	NUMBER OF ELEMENTS INCLUDING ELECTRON, IDENTICAL TO IS*.	C EQPCOM
J	LOCAL INDEX (VARIOUS ROUTINES)	
JAST	READ IN AS COMMA (,) OR PERIOD (.) FOR TEST OF WHETHER THERE IS TO BE ANOTHER CASE (SEE INPUT INSTRUCTIONS).	L BLIMP
JAT(N)	ATOMIC NUMBER OF AN ELEMENT WHICH CONTAINS ALPT(N) ATOMS IN A SPECIES.	L INPUT
JB	LOCAL INDEX	L MATS1
JC	INDEX ON SURFACE CONDENSED SPECIES.	C EQTCOM
JJ	LOCAL INDEX (VARIOUS ROUTINES)	
JL	LOCAL INDEX	L TRMBL
JM	J-1, WHERE JJ IS BASE SPECIES COUNT.	L INPUT

JRHOVW	SET EQUAL TO UNITY IF RHOVW OR FLUXJ ARE READ IN FOR CURRENT TIME. OTHERWISE ZERO.	L REFCON
JT	LOCAL INDEX	L EQUIL
KAPPA	INDEX OF THE NODAL POINT AT WHICH THE VELOCITY RATIO IS FIXED.	C INTCOM
KAT(K)	ATOMIC NUMBER.	C EQPCOM
KIN	NUMBER OF TAPE FROM WHICH DATA IS READ.	C INTCOM
KINEQV	VARIABLE EQUIVALENCED TO KINCOM FOR DUMPING PURPOSES	L DUMCOM
KIP	CONTROL VARIABLE 0 UNLESS PERFORMING ASSIGNED TEMPERATURE CALCULATION DURING KR(9)=6 ENERGY BALANCE PROBLEMS (SEE DEFINITION OF TFZ).	C BUMCOM
KK	LOCAL INDEX (VARIOUS ROUTINES)	
KKR(N)	ARRAY OF INPUT INTEGERS WHICH CONTROL THE VARIOUS OPTIONS OF THE PROGRAM. IDENTICAL TO KR*.	C INTCOM
KOUT	NUMBER OF TAPE ONTO WHICH DATA IS WRITTEN.	C INTCOM
KPHA(N)	PHASE INDEX FOR A SPECIES, 1=GAS, 2=SOLID, 3=LIQUID.	L INPUT
KQ(N)	IDENTICAL TO KR(N)* BY TRANSMITTAL THROUGH CALL LISTS OF PROGRAMS EQUIL AND INPUT. ALSO IDENTICAL TO KD(N)*.	C INTCOM
KR(N)	CONTROL CARD FOR CHEMISTRY CALCULATION (KR(1) = 0 FOR ASSIGNED TEMPERATURE, 1 FOR SURFACE EQUILIBRIUM, 2 FOR ASSIGNED ENTHALPY, KR(2) AND KR(3) ARE 1 IF ELEMENT AND SPECIES DATA ARE TO BE READ IN, OTHERWISE 0, KR(4) IS NOT USED, KR(5) IS 0 IF IT IS NOT A BOUNDARY LAYER EDGE SOLUTION, 1 FOR EXPANSION, 2 FOR STAGNATION, KR(6) IS 0 FOR BOUNDARY LAYER CALCULATION, 2 FOR SURFACE MASS BALANCE, KR(7) CONTROLS DEBUG, IDENTICAL TO KZ(N)*.	C EQPCOM
KR(N)	ARRAY OF INPUT INTEGERS WHICH CONTROL THE VARIOUS OPTIONS OF THE PROGRAM, IDENTICAL TO KKR*.	C INTCOM
KR2	KKR(2) (FIRST GUESS FLAG) PRESERVES VALUE SINCE KKR(2) IS RESET TO ZERO IN SETUP.	L EQUIL
KR9(L)	VALUES OF KR(9) WHEN WALL BOUNDARY CONDITIONS ARE TO BE CHANGED AT DOWNSTREAM STATIONS, CURRENT KR(9) ASSIGNMENT MADE NEAR BEGINNING OF SUBROUTINE NONCER.	C INTCOM
KR17	SAVED VALUE FOR KR(17).	C INTCOM
KS	SURFACE MATERIAL INDEX (FOR EACH STATION)	C CRBCOM

L(N)	INDEX ON COLUMNS DURING INVERSION.	L RERAY
LAM(K,J)	UNITY IF J TH SPECIES CONTAINS K TH ELEMENT, OTHERWISE ZERO	C EQPCOM
LAR(N)	INDEX USED FOR REARRANGING ELEMENTS IN MATRIX OF NONLINEAR EQUATIONS (AM).	C ETACOM.
LAST	ASSIGNED THE VALUE PERIOD (.) THROUGH A DATA STATEMENT FOR USE IN TEST OF WHETHER THERE IS TO BE ANOTHER CASE.	L BLIMP
LEF(K)	FLAG REGARDING MISSING ELEMENTS FOR CURRENT SOLUTION, 3 ALWAYS PRESENT FROM EDGE, 2 ALWAYS PRESENT DUE TO UPSTREAM INJECTION, 1 PRESENT DUE TO LOCAL INJECTION, 0 NOT PRESENT.	C BLOCOM
LEFS(K)	FLAG REGARDING MISSING ELEMENTS FROM PRIOR SOLUTION, SEE LEF FOR NUMERICAL VALUES.	C BLOCOM
LEFT(K,N)	TEMPORARY STORAGE FOR LEF(K) DURING TAPE FLIP-FLOP FOR N = 1 AND 2.	C FLPCOM
LEFUP	UPDATE LEF IF EQUAL TO ZERO (=MITS+II-2 FOR BOUNDARY LAYER SOLUTION, OTHERWISE=1).	L EQUIL
LEFW(K)	FLAG REGARDING MISSING ELEMENTS FOR CURRENT WALL SOLUTION, SEE LEF FOR NUMERICAL VALUES.	C BLOCOM
LI	LOCAL INDEX	L LINMAT
LIM(K,KK)	LAM(K,KK) FOR KKTH BASE SPECIES.	L INPUT
LL(MK)	INDEX ON MASS BALANCE WHICH IS CONTROLLED BY N TH KINETIC REACTION.	C KINCOM
LL(N)	ROW INDEX OF PIVOT FOR NTH COLUMN.	L RERAY
LLL(N)	COLUMN INDEX OF PIVOT FOR NTH ROW.	L RERAY
LNZ	LOCAL INDEX	L RECASE
LPI	LOCAL INDEX (VARIOUS ROUTINES)	
LR	LOCAL INDEX	L TRMBL
LRK	LOCAL INDEX	L TRMBL
LS	INDEX USED TO REARRANGE COLUMNS IN RERAY (SEE LAR)	L RERAY
LSKIP	LOCAL INDEX	L NONCER
L2	INDEX ON PYROLYSIS GAS COMPONENT	C EQTCOM
L3	INDEX ON CHAR COMPONENT	C EQTCOM

M	LOCAL INDEX (VARIOUS ROUTINES)	
M1	COUNT ON PRINCIPAL SPECIES AFTER ORDERING IB.	L CRECT
MA(MK)	ORDERING VECTOR BASED ON HAVING RAT IN DESCENDING SEQUENCE	C KINCOM
MAT1I	3 * NETA - 2. NUMBER OF TAYLOR SERIES EXPANSIONS AND LINEAR BOUNDARY CONDITIONS INVOLVING F(1,I) AND ITS DERIVATIVES.	C INTCOM
MAT1J	NETA + 3. NUMBER OF LINEARIZED MOMENTUM EQUATIONS AND BOUNDARY CONDITIONS.	C INTCOM
MAT2I	2 * NETA. NUMBER OF TAYLOR SERIES EXPANSIONS AND LINEAR BOUNDARY CONDITIONS INVOLVING G(1,I) AND ITS DERIVATIVES OR THE K TH SPECIES. SP(1,I,K). AND ITS DERIVATIVES.	C INTCOM
MAT2J	NETA. NUMBER OF LINEARIZED ENERGY OR K TH ELEMENTAL CONSERVATION EQUATIONS AND BOUNDARY CONDITIONS.	C INTCOM
MELT	INDEX ON PHASE CHANGING SPECIES.	C EQTCOM
MI	MA(K)	L KINET
MITS	COUNTER FOR BOUNDARY LAYER ITERATIONS. IDENTICAL TO ITS*.	C INTCOM
MM	LOCAL INDEX (VARIOUS ROUTINES)	
MOA(J)	ALPHANUMERIC VARIABLE. FIRST OF TWO PORTIONS OF SPECIES NAME. IDENTICAL TO FAMOA*.	C BLQCOM
MOB(J)	ALPHANUMERIC VARIABLE. SECOND OF TWO PORTIONS OF SPECIES NAME. IDENTICAL TO FAMOB*.	C BLQCOM
MODE	STORED VALUE FOR KR(1)*.	C EQTCOM
MOE	FLAG SET IN EQUIL AND USED IN CRECT. ZERO RESULTS IN EMPHASIZING EQUILIBRIUM EQUATIONS DURING CHEMISTRY CONVERGENCE. ONE RESULTS IN EMPHASIZING MASS BALANCES.	L EQUIL
MP	INDICES USED IN REARRANGING REACTIVE MASS BALANCES ACCORDING TO CONTROLLING REACTIONS.	L KINET
MPI	LOCAL INDEX (VARIOUS ROUTINES)	L IMONE
MPJ	LOCAL INDEX (VARIOUS ROUTINES)	L IMONE
MSD(N)	HAS THE VALUE OF IS AT THE BEGINNING OF N TH REGION BOUNDED BY DISCONTINUITIES (MSD(1)=1 BY DEFINITION) WHERE IS IS THE INDEX ON S.	C PRMCOM
MT	NUMBER OF KINETICALLY CONTROLLED REACTIONS.	C KINCOM

MWF	CONTROL VARIABLE (=1 FOR NEW CASE. SET TO ZERO AT THE END OF SUBROUTINE SETUP).	C INTCOM
N1	NUMBER OF ROWS + 1	L RERAY
NAM	NUMBER OF NONLINEAR EQUATIONS NOT INCLUDING NONLINEAR WALL BOUNDARY CONDITIONS, NNLEQ-NRNL.	C INTCOM
NAT	NUMBER OF ONE OF TWO TAPES USED IN FLIP-FLOP.	C INTCOM
NAT2	NUMBER OF ONE OF TWO TAPES USED IN FLIP-FLOP.	C INTCOM
NC	NUMBER OF COMPONENTS OF THE NONREACTING FLUID MIXTURE IN KR(7)=1 OPTION.	C STTCOM
NCV	NONCONVERGENCE COUNT. INITIALLY ZERO. INCREMENTED BY ONE FOR EACH NONCONVERGENT CHEMISTRY SOLUTION.	L EQUIL
ND	DIMENSION TRANSMITTED THROUGH CALL	L RERAY
NDISC	NUMBER OF DISCONTINUITIES.	C PRMCOM
NELM	NUMBER OF MAXIMUM LINEAR ERRORS ELM.	C ERRCOM
NEN	NUMBER OF ENTRIES IN ENTROPY TABLE	C EDGCOM
NENLM	NUMBER OF MAXIMUM NONLINEAR ERRORS ENLM.	C ERRCOM
NETA	NUMBER OF NODAL POINTS ACROSS BOUNDARY LAYER INCLUDING WALL AND EDGE.	C INTCOM
NFF	NUMBER OF SPECIES FOR WHICH DIFFUSION FACTORS, FF(J), ARE TO BE READ IN.	L INPUT
NFTA(J)	FIRST OF TWO PORTIONS OF NAME OF MOLECULE FOR WHICH DIFFUSION FACTOR, FF(J), IS BEING READ IN.	L INPUT
NFTH(J)	SECOND OF TWO PORTIONS OF NAME OF MOLECULE FOR WHICH DIFFUSION FACTOR, FF(J), IS BEING READ IN.	L INPUT
NFM	NUMBER OF SIGNIFICANT SPECIES PLUS NUMBER OF NONPRESENT ELEMENTS.	L MATER
NITEM	NUMBER OF TIMES (OR SUBCASES).	C INTCOM
NLEQ	NUMBER OF LINEAR EQUATIONS, MAT1I+NSP*MAT2I.	C INTCOM
NM	NUMBER OF ROWS LESS ONE	L RERAY
NN	NUMBER BY WHICH COLUMNS EXCEED ROWS IN PRINCIPAL ARRAY	L RERAY
NNLEQ	MAT1J + NSP * MAT2J. TOTAL NUMBER OF NONLINEAR EQUATIONS.	C INTCOM

NNN	NUMBER OF COLUMN VECTORS IN SECONDARY ARRAY	L RERAY
NON	CONTROL VARIABLE USED AFTER RETURNING FROM SUBROUTINE OUTPUT (-1 WHEN RERUNNING FROM OUTPUT DURING ITERATIONS, 0 WHEN CONVERGED, +1 WHEN NONCONVERGED AFTER ALLOWED NUMBER OF ITERATIONS).	C INTCOM
NP	NUMBER OF COLUMNS IN PRIMARY ARRAY.	L RERAY
NPR	NUMBER OF DERIVATIVE PROPERTIES TO BE EVALUATED	L PROPS
NRNL	NSP + 1, NUMBER OF REDUCED NONLINEAR EQUATIONS.	C INTCOM
NS	NUMBER OF STREAMWISE STATIONS.	C INTCOM
NSD(N)	NUMBER OF STATIONS CONTAINED IN N TH REGION BOUNDED BY DISCONTINUITIES (S(1) CONSIDERED A DISCONTINUITY IN THIS DEFINITION).	C PRMCOM
NSP	NUMBER OF ELEMENTS IN THE SYSTEM, NOT INCLUDING ELECTRONS.	C INTCOM
NSPEC	NUMBER OF SPECIES, IDENTICAL TO N*.	C BLQCOM
NSPM1	NSP-1	C INTCOM
NTIMF	CURRENTLY SET TO UNITY.	C INTCOM
NUL	ZERO.	L HISTXI
N2I	LOCAL INDEX	L NONCER
N7	ITERATION AT WHICH DIAGNOSTIC OUTPUT WILL COMMENCE	L EQUIL
OMEGA	PARAMETER OF THIS NAME USED IN TRANSPORT PROPERTY CALCULATIONS INTRODUCED IN EQ(4) OF NASA CR-1063, NUMERICALLY EQUAL TO 1.07/(T/106.7) ** 0.159	L PROPS
OUTEQV	VARIABLE EQUIVALENCED TO OUTCOM FOR DUMPING PURPOSES	L DUMCOM
P	PRESSURE.	C EQPCOM
PA(K,KK)	PARTIAL DERIVATIVE OF PROPERTY K WITH RESPECT TO LOG T, LOG AA, LOG(Y(KK-2)).	L PROPS
PE(L,1)	STATIC PRESSURE.	C EDGCOM
PHIK(I,K)	SOURCE TERM FOR KTH ELEMENT (EQUAL TO ZERO IN MIXED EQUILIBRIUM-FROZEN BOUNDARY LAYER).	C PRPCOM
PHIKP(K)	DERIVATIVE OF PHIK WITH RESPECT TO ETA.	C PRPCOM
PI	P(I) IN MIXING LENGTH FORMULATION.	C EPSCOM

PID	LOCALLY DEFINED VARIABLE	L TRNBL
PIFASF	PRODUCT OF DAMPING FACTORS.	C BLOCOM
PIM	P AT NODE I-1	L TRNBL
PIN	P * (1D00)**(-5) USED TO INITIALIZE PARTIAL PRESSURES.	L EQUIL
PIN	SAME AS IN EQUIL.	L WATER
PINF	FREE-STREAM STATIC PRESSURE	C EDGCOM
PINL	LOG (PIN).	L EQUIL
PKP(MK)	FORWARD RATE OF REACTION.	C KINCOM
PKR(MK)	REVERSE RATE OF REACTION.	C KINCOM
PLM	SUMMATION VN(J)*WTM(J) FOR ALL CONDENSED SPECIES.	L EQUIL
PNR(MK)	NET FORWARD RATE OF REACTION.	C KINCOM
PNU(K,MK)	STOICHIOMETRIC PRODUCT COEFFICIENT ON K TH BASE SPECIES.	C KINCOM
PNU1	VN(J) * FF(J) SUMMED OVER ALL GASEOUS SPECIES (=VNU1 *P).	L PROPS
PNU2	VN(J) * WTM(J) / FF(J) SUMMED OVER ALL SPECIES N* (=VNU2 * P).	L PROPS
PNU6	VN(J)/(FF(J) * (WD4-VN(J) * FF(J) * WDR)) SUMMED OVER ALL SPECIES N*.	L PROPS
PNUS(K)	SUMMATION VNU(J,K) * VN(J) OVER ALL GASES J.	L WATER
PR(I)	PRANDTL NUMBER.	C PRPCOM
PRA	CONSTANT IN THE PRANDTL NUMBER RELATION DEFINING PR (SEE PRNUM).	C STTCOM
PRB	CONSTANT IN THE PRANDTL NUMBER RELATION DEFINING PR (SEE PRNUM).	C STTCOM
PRC	CONSTANT IN THE PRANDTL NUMBER RELATION DEFINING PR (SEE PRNUM).	C STTCOM
PRD	CONSTANT IN THE PRANDTL NUMBER RELATION DEFINING PR (SEE PRNUM).	C STTCOM
PRNUM	PRANDTL NUMBER IF CONSIDERED CONSTANT, OTHERWISE, IT IS A CONSTANT IN THE RELATION, PR=PRNUM+PRA * T ** PRB+PRC*T ** PRD. USED IN MR(7)= 1 OPTION ONLY.	C STTCOM
PRF(L)	RATIO OF LOCAL STATIC PRESSURE TO STAGNATION PRESSURE PTET	C BNDCOM

PREQ	VARIABLE EQUIVALENCED TO PORTION OF PRPCOM FOR STORAGE TRANSFER	L NONCER
PRF	LOCALLY DEFINED VARIABLE	L TRMBL
PRMEQV	VARIABLE EQUIVALENCED TO PRMCOM FOR DUMPING PURPOSES	L DUMCOM
PRMU(K,MK)	PMU-RMU	C KINCOM
PRP	LOCALLY DEFINED VARIABLE RELATIVE TO ARRAY OF DERIVATIVE PROPERTIES BEING CALCULATED	L PROPS
PRPEQV	VARIABLE EQUIVALENCED TO PRPCOM FOR DUMPING PURPOSES	L DUMCOM
PRR	ARGUMENT REPRESENTING PRESSURE	L EQUIL
PRT	TURBULENT PRANDTL NUMBER	C EPSCOM
PTE(L,1)	LOCAL TOTAL PRESSURE.	C EDGCOM
PTET(M)	STAGNATION PRESSURE.	C PRMCOM
PV(N,NN)	DERIVATIVES OF VMU3 (NN=1), VMU4(NN=2),HTIL(NN=3) AND ZK(K) (NN=3+K) WITH RESPECT TO ENTHALPY (N=1), PRESSURE (N=2) AND K TH ELEMENTAL MASS FRACTION (N=2+K).	L PROPS
QA	LOCALLY DEFINED VARIABLE	L SLOPQ
QB	LOCALLY DEFINED VARIABLE	L SLOPQ
QC	LOCALLY DEFINED VARIABLE	L SLOPQ
QCHEM(N)	DIFFERENCE BETWEEN DIFFUSIVE HEAT FLUX AND THAT CALCULATED USING CHL FOR HEAT-TRANSFER COEFFICIENT	L FELTRU
QI	NUMBER INTRODUCED INTO CALCULATION OF BETAM (WHICH DIFFERS FOR VARIOUS BODY SHAPES) DUE TO CHANGE IN MANNER OF INTEGRATION IN THE VICINITY OF THE STAGNATION POINT OR LEADING EDGE.	L REFCON
QR(I)	NET RADIATION FLUX TOWARD THE SURFACE (SET EQUAL TO ZERO IN BLIMP, COMPUTED BY SUBROUTINE RAD IN RABLE).	C PRPCOM
QS	LOCALLY DEFINED VARIABLE	L TRMBL
QW	DIFFUSIVE HEAT FLUX AT THE WALL, C32/C3 EVALUATED AT WALL.	C FLXCOM
R	LOCALLY DEFINED VARIABLE	L ERP
RA(N)	HEAT OF FORMATION OF MOLECULE AT 298 DEG K FROM JANAF BASE STATE, CAL/MOLE. N=1 OR 2 FOR LOW AND HIGH TEMPERATURE RANGES, RESPECTIVELY.	L INPUT

RADFL(M)	INCIDENT RADIATION FLUX ABSORBED BY THE SURFACE AT STATION S(I).	C PRMCOM
RADNO	ACTUAL NOSE RADIUS OF A SPHERICALLY TIPPED BODY.	C PRMCOM
RADR(L)	RATIO OF INCIDENT RADIATION FLUX ABSORBED BY THE SURFACE TO THE VALUE AT STATION S(1). RADFL.	C PRMCOM
RADS(L)	INCIDENT RADIATION FLUX ABSORBED BY THE SURFACE.	C PRMCOM
RAT1(N)	FRACTIONAL CONTRIBUTION OF RHOE UE CM TERM TO DIFFUSIVE HEAT FLUX	L FELTRU
RAT2(N)	FRACTIONAL CONTRIBUTION OF RHOE UE CH TERM TO DIFFUSIVE HEAT FLUX	L FELTRU
RAT3(N)	RATIO OF MASS TO HEAT-TRANSFER COEFFICIENTS	L FELTRU
RAT(MK)	LARGEST OF PKP, PKR, PMR. MEASURE OF REACTION IMPORTANCE.	C KINCOM
RC(J,N)	CURVE FIT CONSTANT FOR THERMODYNAMIC DATA (THE QUANTITY F3 DISCUSSED IN GROUP 12 OF INPUT INSTRUCTIONS), N=1 OR 2 FOR LOW AND HIGH TEMPERATURE RANGES,RESPECTIVELY.	C EQPCOM
RD(J,N)	CURVE FIT CONSTANT FOR THERMODYNAMIC DATA (THE QUANTITY F4 DISCUSSED IN GROUP 12 OF INPUT INSTRUCTIONS), N=1 OR 2 FOR LOW AND HIGH TEMPERATURE RANGES,RESPECTIVELY.	C EQPCOM
RE(J,N)	CURVE FIT CONSTANT FOR THERMODYNAMIC DATA (THE QUANTITY F5 DISCUSSED IN GROUP 12 OF INPUT INSTRUCTIONS). N=1 OR 2 FOR LOW AND HIGH TEMPERATURE RANGES,RESPECTIVELY.	C EQPCOM
RED	REYNOLDS NUMBER ON DEL WHERE DEL IS THE Y DIMENSION NORMALIZING PARAMETER. ALSO, RED=VMUE(L)/ALPHASTAR WHERE ALPHASTAR IS THE FLUX NORMALIZING PARAMETER DEFINED BY EQ. 44 OF NASA CR 1062.	C EPSCOM
REF2	LOCALLY DEFINED VARIABLE	L OUTPUT
REF3	LOCALLY DEFINED VARIABLE	L OUTPUT
REF4	LOCALLY DEFINED VARIABLE	L OUTPUT
REG2	LOCALLY DEFINED VARIABLE	L OUTPUT
REG3	LOCALLY DEFINED VARIABLE	L OUTPUT
RERAD	RADIATION FLUX FROM WALL	L OUTPUT
RES	REYNOLDS NUMBER BASED ON DISTANCE S.	C OUTCOM
RETA	LOCALLY DEFINED VARIABLE	L OUTPUT

RETHMO	REYNOLDS NUMBER BASED ON MOMENTUM THICKNESS	L OUTPUT
RETR	TRANSITION REYNOLDS NUMBER BASED ON MOMENTUM THICKNESS.	C EPSCOM
RF(J,N)	CURVE FIT CONSTANT FOR THERMODYNAMIC DATA (THE QUANTITY F6 DISCUSSED IN GROUP 13 OF INPUT INSTRUCTIONS), N=1 OR 2 FOR LOW AND HIGH TEMPERATURE RANGES,RESPECTIVELY.	C EQPCOM
RHO(I)	DENSITY OF GAS MIXTURE.	C PRPCOM
RHOE(I)	DENSITY OF BOUNDARY LAYER EDGE GAS.	C EDGCOM
RHOINF	FREE-STREAM DENSITY	C EDGCOM
RHOP(I)	DERIVATIVE OF RHO WITH RESPECT TO ETA.	C PRPCOM
RHOVS	-RHOVW(L,1)/ALPHASTAR. SEE NASA CR 1062 FOR ALPHASTAR.	C EPSCOM
RHOVW(L,1)	CONVERGED VALUE FOR SURFACE ABLATION RATE.	C WALCOM
RHR	DENSITY.	L EQUIL
RI	LOCALLY DEFINED VARIABLE	L TRMBL
RMMG	RATIO OF MOLECULAR WEIGHT OBTAINED BY SUMMING PARTIAL PRESSURES OVER ALL SPECIES TO THE MOLECULAR WEIGHT OBTAINED BY SUMMING OVER GAS PHASE SPECIES ONLY.	C EQTCOM
RMMGS	RMMG*RMMG	L MATER
RMU(K,MK)	STOICHIOMETRIC REACTAN, COEFFICIENT ON K TH BASE SPECIES.	C KINCOM
RNOSE	EFFECTIVE NOSE RADIUS.	C PRMCOM
ROKAP(L)	1 FOR PLANAR BODIES. LOCAL BODY RADIUS FOR AXISYMMETRIC BODIES, SPREADING FACTOR WHEN USING AXISYMMETRIC ANALOGY (SEE REFERENCE 6) BODIES.	C PRMCOM
RR	DENSITY RATIO	L TRMBL
RRED	LOCALLY DEFINED VARIABLE	L TRMBL
RRP	LOCALLY DEFINED VARIABLE	L TRMBL
RRPD	LOCALLY DEFINED VARIABLE	L TRMBL
RSIG(MK)	RELATIVE SIGNIFICANCE OF KINETIC REACTION IN MASS BALANCE.	C KINCOM
RSQA	RMMGS*EEE/AA	L MATER
RT	PERFECT GAS CONSTANT, R, TIMES TEMPERATURE, T.	L KINET

S(L)	STREAMWISE COORDINATE ALONG BODY.	C PRMCOM
S(N)	LARGEST CONTRIBUTION TO TERM IN N TH COLUMN.	L RERAY
SALPH	SIGNED) VALUE OF ALPH	L TRMBL
SB(J)	ENTROPY.	C EQTCOM
SC(I)	REFERENCE SCHMIDT NUMBER. SEE EQ(46) OF NASA CR-1062.	C PRPCOM
SCT	TURBULENT SCHMIDT NUMBER	C EPSCOM
SD(N)	RATIO OF RESIDUAL TERM IN N TH COLUMN TO S(N).	L RERAY
SDUM1(L)	VARIABLE OF INTEGRATION IN CALCULATION OF XI IN REFCON, TEMPORARY STORAGE AREA IN OTHER ROUTINES.	C TEMCOM
SDUM2(L)	VARIABLE OF INTEGRATION IN CALCULATION OF FW IN REFCON, TEMPORARY STORAGE AREA IN OTHER ROUTINES.	C TEMCOM
SDY	LOCALLY DEFINED VARIABLE	L TRMBL
SF(MS)	STREAMFUNCTION IN ENTROPY LAYER TABLE	C EDGCOM
SHAPE	DFLST/THMOM. SHAPE FACTOR.	C OUTCOM
SHEAR	WALL SHEAR GIVEN BY CAPC(1)/ALPH * VMUE(IS) * UE(IS)/C89 * F(3.)/32.1740	C OUTCOM
SHIP	SAVED VALUE OF INPUT ENTHALPY.	L EQUIL
SHMELT	ENTHALPY OR ENTROPY OF FUSION OF A SPECIES IF TEMPERATURE EQUALS FUSION TEMPERATURE OF THAT SPECIES.	L MATER
SIGMA	COLLISION CROSS SECTION FOR REFERENCE SPECIES	C EQTCOM
SIP	ENTROPY INPUT.	C EQTCOM
SLAM(K)	DEFINED BY EQ(83) OF NASA CR-1064.	C EQTCOM
SM(J)	ENTROPY OF FUSION.	C EQPCOM
SMELT	SM(J) IF J TH SPECIES IS CHANGING PHASE, OTHERWISE 0.	C EQTCOM
SP(N,I,K)	ELEMENTAL MASS FRACTION (N=1) AND ITS DERIVATIVES OF ORDER N-1 WITH RESPECT TO ETA.	C VARCOM
SPEASE	SAVED VALUE OF PTEASE	L EQUIL
SPD(N)	D1 * SP(N,I,K) * D2 * HSP(I,N,K) FOR N=1 THROUGH 3, D1 * SP(3,I-1,K) * D2 * HSP(I-1,3,K) FOR N=4.	L HISTXI

SPDUM(K)	DIMENSIONED VARIABLE USED IN VARIOUS SUBROUTINES BUT NOT USED FOR TRANSMITTING INFORMATION BETWEEN SUBROUTINES.	C TEMCOM
SPE(K,L,1)	ELEMENTAL MASS FRACTION AT BOUNDARY LAYER EDGE.	C EDGCOM
SPLE(N,K)	ERROR FOR THE TAYLOR SERIES EXPANSIONS INVOLVING SP(1,I,K) AND THEIR DERIVATIVES.	C ERRCOM
SPLEM(K)	MAXIMUM VALUE OF SPLE(N,K).	C ERRCOM
SPNEW	VARIABLE USED TO DENOTE PRESENCE OF NEW ELEMENT IN SYSTEM	L RNLCER
SPNEW	VARIABLE USED TO DENOTE PRESENCE OF NEW ELEMENT IN SYSTEM	L NONCER
SPNLEM(K)	ERROR FOR THE LINEARIZED ELEMENTAL CONSERVATION EQUATIONS.	C ERRCOM
SPW(K,L,1)	CONVERGED VALUE FOR ELEMENTAL MASS FRACTION OF BOUNDARY LAYER GAS AT THE WALL.	C WALCOM
SREF	ENTROPY OF REFERENCE STREAMLINE	C EDGCOM
SS	LOCALLY DEFINED VARIABLE	L SLOPQ
SSIP	SAVED VALUE OF INPUT ENTROPY.	L EQUIL
SSTAG	STAGNATION ENTROPY BASED ON 1 ATM PRESSURE.	L STATE
SSTAGA	STAGNATION ENTROPY BASED ON ACTUAL PRESSURE.	L STATE
STEF	STEFAN-BOLTZMANN CONSTANT.	C CRBCOM
STTEQV	VARIABLE EQUIVALENCED TO STTCOM FOR DUMPING PURPOSES	L DUMCOM
SUMD	RT*D LOG KP/D LOG T OF KINETIC REACTION.	L KINET
SUMG	OFF-DIAGONAL COLUMN SUMS OF GAMK USED TO STRENGTHEN DIAGONAL DOMINANCE OF ARRAY.	L EQUIL
SUMK	LOG KP OF KINETIC REACTION.	L KINET
SUML	LOG (SUMN/P)	C EQTCOM
SUMN	SUMMATION OF PARTIAL PRESSURES FOR ALL GAS PHASE SPECIES.	C EQTCOM
SUMP	SUM OF PRODUCT Y(N)	L KINET
SUMR	SUM OF REACTANT Y(N)	L KINET
T	STATIC TEMPERATURE IN DEG K. IDENTICAL TO Z+	C EQPCOM
T(T)	STATIC TEMPERATURE IN DEG R. IDENTICAL TO TT*.	C PRPCOM
TAU(K,KK)	INTERMEDIATE ARRAY USED IN FORMING UM.	L INPUT

TC(J)	-D LOG KP / D LOG T FOR FORMATION REACTION OF J TH SPECIES	C EQTCOM
TCW	TC EVALUATED AT THE WALL FOR THE (ISP)TH ELEMENT.	C NONCOM
TE(L)	TEMPERATURE AT BOUNDARY LAYER EDGE.	C EDGCOM
TEMEQV	VARIABLE EQUIVALENCED TO TEMCOM FOR DUMPING PURPOSES	L DUMCOM
TF(J)	FAIL TEMPERATURE OF SPECIES J.	E EQPCOM
TFMAX	MAXIMUM FAIL TEMPERATURE OF CANDIDATE SURFACE SPECIES.	L INPUT
TFZ	SURFACE TEMPERATURE TO WHICH CONVERGENCE IS TEMPORARILY ATTEMPTED DURING ENERGY BALANCE PROBLEMS USING KR(9)=6.	C BUMCOM
THCOND	ENTHALPY THICKNESS	L OUTPUT
THELEM(K)	MASS THICKNESSES GIVEN BY DUZ(K)/DUM(K) WHERE DUZ(K) IS THE SUMMATION OVER KK OF C89/ALPH * ((F(1,NETA)-F(1,1)) * SP(1,NETA,KK)-XSP(S,KK))/ WTM(KK) * CIJ(K,KK) AND DUM(K) IS THE SUMMATION OVER KK OF (SP(1,NETA,KK)-SP(1,1,KK)/WTM(KK) * CIJ(K,KK).	L OUTPUT
THENGY	ENERGY THICKNESS GIVEN BY C89/ALPH * ((F(1,NETA)-F(1,1)) * G(1,NETA)-XG(S))/(G(1,NETA)-G(1,1))	C OUTCOM
THMOM	MOMENTUM THICKNESS GIVEN BY C89/ALPH * ((F(1,NETA)-F(1,1)) -XM(S)/ALPH)	C OUTCOM
TIMD	REAL ELAPSED TIME SINCE BEGINNING OF SOLUTION	L ITERAT
TIME(M)	TIME (OR SUBCASE)	C PRMCOM
TION	TEMPERATURE BELOW WHICH IONIZATION WILL BE SUPPRESSED	L EQUIL
TITL(N)	TYPE OF AVERAGING EMPLOYED TO CMK(N)	L FELTRU
TK(K,N)	GRAM ATOMS OF ELEMENT K PER UNIT MASS OF COMPONENT N.	C EQPCO
TM	MAXIMUM OR MINIMUM TEMPERATURE IF DELTA T IS POSITIVE OR NEGATIVE. RESPECTIVELY.	L CRECT
TMAX	MAXIMUM TEMPERATURE ALLOWED FOR CURRENT ITERATION.	C EQTCOM
TMIN	MINIMUM TEMPERATURE ALLOWED FOR CURRENT ITERATION.	C EQTCOM
TMU3	VN(J) / FF(J) SUMMED OVER ALL SPECIES N*. (=VMU3 * VMU2 * P).	L PROPS
TP	DERIVATIVE OF T WITH RESPECT TO ETA.	C PRPCOM
TQ(K,N)	GRAM ATOMS OF BASE SPECIES K PER UNIT MASS OF COMPONENT N. SEE W(N) FOR DEFINITION OF COMPONENTS	C EQPCOM

TREF	GROUP OF TERMS WHICH APPEARS IN DERIVATIVES OF PI. (REYNOLDS NUMBER ON DELST)/C26/(2.*CAPC(I)**2*YAP**2*PI).	C EPSCOM
TS	PHASE CHANGE TEMPERATURE.	L INPUT
TT(I)	STATIC TEMPERATURE IN DEG R. IDENTICAL TO T.	C PRPCOM
TTMAX	MAXIMUM TEMPERATURE ALLOWED FOR THIS SOLUTION.	C EQTCOM
TTMIN	MINIMUM TEMPERATURE ALLOWED FOR THIS SOLUTION.	C EQTCOM
TTVC	VARIABLE T USED IN TRANSVERSE CURVATURE CALCULATIONS	C EDGCOM
TU(J,N)	UPPER TEMPERATURE OF TEMPERATURE RANGE FOR INPUTTING THERMODYNAMIC PROPERTY DATA FOR SPECIES J. N=1 OR 2 FOR LOWER AND UPPER TEMPERATURE RANGES, RESPECTIVELY.	C EQPCOM
TVCC(IS)	CONSTANT USED IN TVC CALCULATIONS	C EDGCOM
TW(L,1)	CONVERGED VALUE OF SURFACE TEMPERATURE.	C WALCOM
TWC(N)	BASE TEMPERATURE USED IN HEAT-TRANSFER-COEFFICIENT CALCULATION	L FELTRU
UE(L)	BOUNDARY-LAYER EDGE VELOCITY.	C EDGCOM
UEDGE	PARAMETER ENTERING INTO ENTROPY LAYER OPTION. SEE EQ(68) OF NASA CR-1062 (SET EQUAL TO UNITY IN PRESENT PROGRAM).	C EDGCOM
UGH	NORMALIZING FACTOR IN GAUSSIAN ELIMINATION.	L INPUT
UINF	FREE-STREAM VELOCITY	C EDGCOM
UKAP	EDGE VELOCITY NORMALIZED BY REFERENCE VELOCITY	L NONCER
UM(K,KK)	MOLECULES OF BASE SPECIES K IN ELEMENT KK.	L INPUT
UNIT(N)	COMPLEX FACTOR HAVING TO DO WITH DAMPING OF KINETICALLY CONTROLLED MASS BALANCES.	C KINCOM
UNIT(N)	SMOOTHING FACTOR RELATED TO IMPOSING RESIDUAL ERROR INTO REACTIVE MASS BALANCES AS A RESULT OF BOUNDARY LAYER DAMPING.	L KINET
V	LOCALLY DEFINED VARIABLE	L INPUT
VA	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
VAREQV	VARIABLE EQUIVALENCED TO VARCOM FOR DUMPING PURPOSES	L DUMCOM
VB	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
VC	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	

VD	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
VE	LOCALLY DEFINED VARIABLE (VARIOUS ROUTINES)	
VEL	VELOCITY.	L EQUIL
VELSQ	SQUARE OF VELOCITY.	L EQUIL
VINT	P * 10**(-6)	L INPUT
VJKW(K)	DIFFUSIVE MASS FLUX OF BASE SPECIES AT THE WALL. CK6(K)/C3 EVALUATED AT THE WALL (IN OUTPUT, VJKW(K) IS MODIFIED TO REPRESENT DIFFUSIVE MASS FLUXES OF ELEMENTS AT THE WALL.	C FLXCOM
VX(K)	SP(1,J,K)	L PROPS
VKAP	FLAG FOR BODY SHAPE (0 FOR PLANAR, 1 FOR AXISYMMETRIC).	C PRKCOM
VK1	LOCALLY DEFINED VARIABLE	L KINET
VK2	LOCALLY DEFINED VARIABLE	L KINET
VK3	LOCALLY DEFINED VARIABLE	L KINET
VLAM	MIXTURE THERMAL CONDUCTIVITY GIVEN BY RHO(I) * DBAR * VMU6 * 1.9869 / (WM * VMU1).	L PROPS
VLAM(J,K)	LAMBDA, DEFINED IN EQ(83) OF NASA CR-1064	E NONCOM
VLNK(J)	LOG KP FOR FORMATION REACTION OF J TH SPECIES	C EQTCOM
VLNKW	VLNK EVALUATED AT THE WALL FOR THE (ISP)TH ELEMENT.	C NONCOM
VMACH	MACH NUMBER	L EQUIL
VMACH	MACH NUMBER.	L STATE
VMAT(N)	SET OF VARIABLES STARTING WITH C1 TO BE STORED ON TAPE.	E MISCOM
VMECH	SURFACE MASS LOSS RATE DUE TO LIQUID LAYER FLOW	L OUTPUT
VMU(I)	VISCOSITY OF MIXTURE, COMPUTED IN SUBROUTINE PROPS AS RHO(I) * DBAR * VMU5/VMU)	C PRPCOM
VMU1	COEFFICIENT MU1 DEFINED IN EQ(22) OF NASA CR-1062.	L PROPS
VMU2	SAME AS VMU2 IN PROPS.	L WATER
VMU2	COEFFICIENT MU2 DEFINED IN EQ(22) OF NASA CR-1062.	L PROPS
VMU5	PROPERTY OF THE GAS MIXTURE WHICH REDUCES TO 1/WM FOR EQUAL DIFFUSION COEFFICIENTS. SEE EQ(28) OF NASA CR-1062	C PRPCOM

VMU3P	DERIVATIVE OF VMU3 WITH RESPECT TO ETA.	C PRPCOM
VMU4P	DERIVATIVE OF VMU4 WITH RESPECT TO ETA.	C PRPCOM
VMU5	CONTRIBUTION TO MIXTURE VISCOSITY GIVEN BY AMU5 * RMMG/AA.	L PROPS
VMU6	CONTRIBUTION TO MIXTURE THERMAL CONDUCTIVITY GIVEN BY (PMU6 + CPTTI/1.9869-2.5 * TMU3) / P	L PROPS
VMU12	PRODUCT OF THE TWO COEFFICIENTS MU1 AND MU2 DEFINED IN EQ (22) OF NASA CR-1062	C PRPCOM
VMUA	CONSTANT IN THE VISCOSITY RELATION MU=(VMUA*T**VMUB)/(VMUC* T+VMUD). USED IN KR(7)=1 OPTION ONLY	C STTCOM
VMUB	CONSTANT IN THE VISCOSITY RELATION DEFINED UNDER VMUA.	C STTCOM
VMUC	CONSTANT IN THE VISCOSITY RELATION DEFINED UNDER VMUA.	C STTCOM
VMUD	CONSTANT IN THE VISCOSITY RELATION DEFINED UNDER VMUA.	C STTCOM
VMUE(I)	VISCOSITY AT BOUNDARY LAYER EDGE.	C EDGCOM
VMW(I)	MOLECULAR WEIGHT OF THE MIXTURE.	C PRPCOM
VMWE	MOLECULAR WEIGHT OF GAS AT BOUNDARY LAYER EDGE.	C EDGCOM
VN(J)	PARTIAL PRESSURE.	C EQPCOM
VNU(J,K)	STOICHIOMETRIC COEFFICIENT ON K TH BASE SPECIES IN FORMATION OF J TH SPECIES.	C EQPCOM
VVOL	LOCALLY DEFINED VARIABLE	L REFCON
W(N)	COMPONENT MASS FLUX AT WALL. W(1) IS EDGE GAS, W(2) IS PYROLYSIS GAS, W(3) IS CHAR	C BLOCOM
WALFDV	VARIABLE EQUIVALENCED TO WALCOM FOR DUMPING PURPOSES	L DUMCOM
WALLJ(K)	NORMALIZED DIFFUSIVE MASS FLUX AT WALL (DEFINED BY EQ(48) OF NASA CR-1062). CK6(K) EVALUATED AT THE WALL	C FLXCOM
WALLQ	NORMALIZED DIFFUSIVE HEAT FLUX AT THE WALL (DEFINED BY EQ (50) OF NASA CR(1062). C32 EVALUATED AT THE WALL	C FLXCOM
WALLQJ(N)	GLOBAL SET OF WALLQ AND WALLJ.	E FLXCOM
WAT(K)	ATOMIC WEIGHT.	C EQPCOM
WD2	1.2 * AISTAR / PMU1	L PROPS
WD4	0.2**4 * WD2	L PROPS

WD5	0.32 * AISTAR / PMU1	L PROPS
WD7	WD2/PMU1 - WD2	L PROPS
WD8	WD4/PMU1-WD5	L PROPS
WDOT	ABLATION RATE IN THE CONVERGED SOLUTION OF MATERIAL CONSIDERED UNDER KR(9) = 3 THROUGH 6	C BUMCOM
WD2	CONSTANT 1.385 WHICH ENTERS INTO CALCULATION OF MIXTURE TRANSPORT PROPERTIES.	L PROPS
WM	MOLECULAR WEIGHT OF MIXTURE.	C EQPCOM
WS	SUM OF PYROLYSIS AND CHAR MASS RATES.	L MATER
WSUM	W(1) + W(2) + W(3)	L NONCER
WT	MOLECULAR WEIGHT AS SUMMED.	L INPUT
WTG	PRESSURE * GAS MOLECULAR WEIGHT.	L MATER
WTL	SUMMATION OF VN(J) * WTM(J) FOR ALL CONDENSED SPECIES.	L MATER
WTM(J)	MOLECULAR WEIGHT OF SPECIES J.	C EQPCON
X(N)	CORRECTIONS OF NONLINEAR VARIABLES IN CHEMISTRY SOLUTION.	E EQTCOM
X1	DAMPED VALUE OF DELTA LN T.	L CRECT
XD	LOCALLY DEFINED VARIABLE	L SLOPD
XG(N)	DEFINED BY EQ(B6) OF NASA CR-1062 EVALUATED FOR P=G(1,I). N= 1 TO 4. XG(5) IS THE INTEGRAL OF (F(2,I)*G(1,I)*DETA) GIVEN BY EQ (B5).	C COECON
XI(L)	TRANSFORMED STREAMWISE COORDINATE DEFINED BY EQS(31) AND (33) OF NASA CR-1552	C MISCOM
XICON(L)	INTEGRAND IN CALCULATION OF XI IN REFCON. TEMPORARY STORAGE AREA IN OTHER ROUTINES.	C TEMCOM
XJ	LOCALLY DEFINED VARIABLE	L MATS1
XK	LOCALLY DEFINED VARIABLE	L MATS1
XKP	LOCALLY DEFINED VARIABLE	L MATS1
XM(N)	DEFINED BY EQ(B6) OF NASA CR-1062 EVALUATED FOR P=F(2,I). N= 1 TO 4. XM(5) IS THE INTEGRAL OF (F(2,I)*F(2,I)*DETA) GIVEN BY EQ(B5)	C COECON
XOT	LOCALLY DEFINED VARIABLE	L SLOPD

XDTT	LOCALLY DEFINED VARIABLE	L SLOPO
XS	LOCALLY DEFINED VARIABLE	L MATSI
XSP(N,K)	DEFINED BY EQ(86) OF NASA CR-1062 EVALUATED FOR P=SP(1,I,K) N=1 TO 4. XSP(5,K) IS THE INTEGRAL OF (F(2,I)*SP(1,I,K) *DETA) GIVEN BY EQ(85)	C COECON
XT	LOCALLY DEFINED VARIABLE	L ABMAX
XTD	LOCALLY DEFINED VARIABLE	L SLOPO
XTT	LOCALLY DEFINED VARIABLE	L SLOPO
Y(I)	ACTUAL DISTANCE FROM BODY MEASURED NORMAL TO SURFACE.	C OUTCON
Y(J)	NATURAL LOG OF PARTIAL PRESSURE (=0 FOR PRESENT CONDENSED SPECIES). IDENTICAL TO YYY(J).	C EQPCOM
YAP	CONSTANT IN MIXING LENGTH EQUATION.	C EPSCOM
YC	INITIAL VALUE OF Y(J)	L INPUT
YDI	LOCALLY DEFINED VARIABLE	L TRMRL
YDIQ	LOCALLY DEFINED VARIABLE	L TRMBL
YDQD	LOCALLY DEFINED VARIABLE	L TRMBL
YDS	LOCALLY DEFINED VARIABLE	L TRMBL
YINT	ALOG(VINT)	L INPUT
YS	LOCALLY DEFINED VARIABLE	L SLOPO
YW(K)	VALUE OF YYY(J) AT WALL (SAVED)	C EQPCOM
Z	STATIC TEMPERATURE IN DEG K, IDENTICAL TO T*.	C EQPCOM
ZG(N,I)	DEFINED BY EQ(94) OF NASA CR-1062 EVALUATED FOR P=G(1,I), N = 1 TO 4	C MISCOM
ZK(K)	QUANTITY FOR ELEMENT K WHICH IS INTRODUCED AS A RESULT OF THE APPROXIMATION FOR BINARY DIFFUSION COEFFICIENTS AND REDUCES TO SP(1,I,K) FOR EQUAL DIFFUSION COEFFICIENTS (SEE EQ(95) OF NASA CR-1062)	C PRPCOM
ZKP(K)	DERIVATIVE OF ZK WITH RESPECT TO ETA.	C PRPCOM
ZW(N,I)	DEFINED BY EQ(94) OF NASA CR-1062 EVALUATED FOR P=F(2,I), N = 1 TO 4.	C MISCOM

ZSP(N,I,K) DEFINED BY EQ(94) OF NASA CR-1062 EVALUATED FOR P=SP(1,I,K) C MISCOH
N = 1 TO 4

SECTION III

LISTING OF FORTRAN V SOURCE DECKS

Listings of Fortran V source code decks for BLIMP are presented in this section. The various subroutines are listed numerically in terms of their file code names.

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      C801A                                                                  B01A 001
            SUBROUTINE DUMCOM(ICK)                                           B01A 002
            COMMON/BLQCOM/  MOA( 71),  MOB( 71),NSPEC,FR( 71,15),W(3),LEF(10) B01A   3
           1 ,LEFS(10),PIEASE,LEFW(10),L2,L3                                 ENTR-MOD
            COMMON/BUMCOM/     BUMP,CORMA,EASE,ICORM,WDOT,TFZ,I777,DTEMP,KIP,IX B01A   5
            COMMON/COECOM/                C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15 B01A   6
           1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C3.,C3 B01A   7
           232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C4 B01A   8
           3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,C B01A   9
           465,C66,C67,C68,C69,C70,C71,C72,C73,C74-C75,C76,C77,C78,C79,C80,C81 B01A  10
           5,C82,C83,C84,C85,C86,C87,C88                                     B01A  11
            COMMON/COECON/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8)   B01A  12
           1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8)     B01A  13
           2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8)  B01A  14
           3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XM(5),XG(5),XSP(5, 9) B01A  15
           4,CKK3( 8, 8)                                                     B01A  16
            COMMON/CRBCOM/HCARB,EMIS,STEF,ADUM,BDUM,CDUM,HTEF,HMAT,EMISC,EMIST B01A  17
           1,HPG,ASU(3),BSU(3),HPYG(3),HCHAR(3),EMIV(3),KS(40),ISU           B01A  18
            COMMON/EDCCOM/              PE(-0, 1),PTE(40, 1),SPE( 8,40, 1),DUES, B01A  19
           1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMWE,CGE,C90 ENTR-MOD
           2,DSIP(40),IDSIP,TTVC,TVCC(40),HEA(40),SF(20),CS(20),CSPR(20),     ENTR-MOD
           3CG(20),CGP(20),SREF,GEP,NEN,UINF,RHCINF,HINF,PINF                 ENTR-MOD
            COMMON/EPSCOM/ELCON,YAP,CLNUM,SCT,PRT,RED,DVS,RHOVS,PI,PIM,CL,    B01A  22
           1 EPSA(15),EPS1,EL(15),DPI(15,2),DEPC,TREF,RETR,VINTR(15)          ENTR-MOD
            COMMON/EQPCOM/  RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2), B01A  24
           1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),WAT(10),  B01A  25
           2 KAT(10),IR(10),IZ,KZ(10),LAMI( 71),P,Z,TK(10, 7),VN( 71),        B01A  26
           3 VNU( 71,10),ITFF,KR2,HCH,NCV,HM,WTM( 71),YYY( 71),YW( 71),GG( 71) B01A  27
           4 ,TQ(10, 7),EPOVRK,SIGMA,BASMOL                                   B01A  28
            COMMON/EQTCOM/SIP,HIP,EEL,EENL,FLIQ,CPF,IRE,IER,AA,IITS,IN,IL,IIT, B01A  29
           1 MODE,HMELT,SMELT,TMAX,TMIN,MELT,SUMN,SUML,WS,WSS,BX,ISP2,ISPQ,   B01A  30
           2 ISP,KKJ,SVA,SVB,SVC,SVD,SUMC,FFF,CMF,EP,RV,IFCJC,WTG,WTL,JC,HHG, B01A  31
           3 CCPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),B8(16),    ENTR-MOD
           4 IP( 71),ALP(10),FNU(10),GAMH(10),GAMF(10),SLAM(10),DY( 71),RVS,  B01A  33
           5 CP( 71),HH( 71),SB( 71),TC( 71),VLNK( 71),E( 71),PNUS(10),       B01A  34
           6 BC(10),BLNK(10),BY(10),IBC(10),BE(10),JZ( 4)                     B01A  35
            COMMON/ERRCOM/FLE( 43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEM     B01A  36
           1,SPLEM( 8),ELM(14),ELMM,IFLM,IGLM,ISPLM( 8),NELM,ILMM,DFL(43)     B01A  37
           2,DGL(30),DSPL(30, 8),FNLE(18),GNLE(15),SPNLE(15, 8),ENL(153)      B01A  38
           3,FNLEM,GNLEM,SPNLEM( 8),          ENLMM,IFNLM,IGNLM,ISPNLM( 8)    B01A  39
           4,NENLM,INLMM,DFNL(18),DGNL(15),DSPNL(15, 8),DRNL(10)              B01A  40
            COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)      B01A  41
           1,LAR(153),BA1(43,18),BA2(30,15)                                   B01A  42
            COMMON/FLPCOM/TXI(2),TUE(2),TRHOE(2),TTE(2),TVMUE(2),TMAT(566,2)  B01A  43
           2,THF(15,2),LEFT(10,2),TPE(2),TRACS(2),TDSIP(2),KQT(2)             B01A  44
            COMMON/FLXCOM/DELQW,DELJW( 8),DQNL(153),DJNL(153, 8),WALLQ         B01A  45
           1,WALLJ( 8),QW,VJKW( 9),TPWALL                                     B01A  46
            COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8 B01A  47
           1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HHUE,HFW,DLX2  B01A  48
           2,C3M(40),BETAM(40)                                                B01A  49
            COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,N B01A  50
           1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, IIS,KAPPA,CBAR,CASE(15) B01A  51
           2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B01A  52
           3,KAUXO,JTIME,JSPEC,MD(3),IU,ISH                                   ENTR-MOD
            COMMON/KINCOM/MT,FKF(10),EAK(10),EXK(10),PMU(10,10),RMU(10,10),   B01A  54
           1 DKPT(10),PKP(10),PKR(10),RAT(10),RSIG(10),MA(10),LL(10),PMR(10), B01A  55
           2 PRMU(10,10),EESE(10)                                             B01A  56
            COMMON/NONCOM/AM(153,153),DVNL(153),TCW,                          B01A  57
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      1VLNKW,DLPH( 9),DLPK( 8, 9),DTHW,DTKW( 8),FLUXJB( 9)                  B01A  58
       COMMON/OUTCOM/Y(15),RES,DELST,THENGY,THMOM,CH,BLOW,SHEAR,CF,SHAPE  B01A  59
      1 ,CM( 9),THELEM( 9)                                                 B01A  60
       COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40)   B01A  61
      1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO,    B01A  62
      2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                              B01A  63
       COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15)     B01A  64
      1,CPBAR(15),VMW(15),PHIK(15, 8),DRHOH,DRHOK( 8),ZK( 8),DZKH( 8),  DB01A  65
      2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8)B01A  66
      3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)     B01A  67
      4,DPHIKK( 8, 8),       DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL    B01A  68
      5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15),  RHOP   B01A  69
      6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15)     B01A  70
       COMMON/STTCOM/GAM1,PRDUM,PRA,PRB,PRC,PRD,VMUA,VMUB,VMUC,VMUD,NC,    B01A  71
      1 FLD(6,3),VMHD                                                      B01A  72
       COMMON/TEMCOM/SPDUM( 8),DER(40),DUMM1(15),SLOPE(15),REDUM(15)       B01A  73
      1,SDUM1(40),SDUM2(40),FWDUM(40),XICON(40),FWCON(40),FWINIT( 1)       B01A  74
      2,XIINIT( 1),NUDS( 40)                                               B01A  75
       COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                      B01A  76
       COMMON/WALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPW( 8,40, 1)           B01A  77
      1,RHOVW(40, 1),FLUXJ( 3,40, 1),IHW,ITW,IFW,ISPW,IRHOVW,IFLUXJ        B01A  78
       EQUIVALENCE (FLPEQV,TXI),(BLQEQV,MOA),(BUMEQV,BUMP),(COEEQV,C5),
      1(CONEQV,CK1),(CRBEQV,HCARB),(EDGEQV,PE),(EQPEQV,RB),(EPSEQV,ELCON)
      2,(KINEQV,MT),(EQTEQV,SIP),(ERREQV,FLE),(ETAEQV,ETA),(HISEQV,C1),
      3 (INTEQV,KIN),(NONEQV,AM),(PRMEQV,TIME),(PRPEQV,PR),(STTEQV,GAM1),
      4 (TEMEQV,SPDUM),(VAREQV,F),(WALEQV,FW),(FLXEQV,DELQW),(OUTEQV,Y)
       DIMENSION BLQEQV( 1242),BUMEQV(   10),COEEQV(   84),CONEQV(  423)
      1          ,CRBEQV(   67),EDGEQV(  649),EPSEQV(  381),EQPEQV( 2352)
      2          ,EQTEQV( 1033),ERREQV( 1468),ETAEQV( 1463),FLPEQV( 1200)
      3          ,FLXEQV( 1406),HISEQV( 1171),INTEQV(  108),KINEQV(  421) ENTR-MOD
      4          ,NONEQV(23663),OUTEQV(   42),PRMEQV(  517),PRPEQV(  608)
      5          ,STTEQV(   30),TEMEQV(  335),VAREQV(  511),WALEQV(  606)
       DATA ATA(1),ATB(1),ATC(1)/4H    ,4H    ,4H    /
       IF (ICK-101) 70,10,40
   10 READ( 12 )  FLPEQV,BLQEQV,BUMEQV,COEEQV,CONEQV,CRBEQV,EPSEQV,
     1             EDGEQV, EQPEQV, KINEQV, EQTEQV, ERREQV, ETAEQV,
     2             FLXEQV, HISEQV, INTEQV, NONEQV, OUTEQV, PRMEQV,
     3             PRPEQV, STTEQV, TEMEQV, VAREQV, WALEQV
       GO TO 70
   40 WRITE(12 )  FLPEQV,BLQEQV,BUMEQV,COEEQV,CONEQV,CRBEQV,EPSEQV,
     1             EDGEQV, EQPEQV, KINEQV, EQTEQV, ERREQV, ETAEQV,
     2             FLXEQV, HISEQV, INTEQV, NONEQV, OUTEQV, PRMEQV,
     3             PRPEQV, STTEQV, TEMEQV, VAREQV, WALEQV
   70 CONTINUE
    5 RETURN                                                               C01A 067
       END                                                                 C01A 068
C8LIMP                          BOUNDARY LAYER INTEGRAL MATRIX PROCEDURE   BLIM 001
       DIMENSION FT(21)
       COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB02A   3
      1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B02A   4
      2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NET2,IDENT,KR9(40) B02A   5
      3,KAUXO,JTIME,JSPEC,MD(3),IU,ISH                                    ENTR-MOD
       COMMON/PRMCOM/TIME(50),PRE(40),PTET(50),GE(50),S(40),ROKAP(40)      ENTR-MOD
      1 ,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF(50),IPRE,RADNO     ENTR-MOD
      2 ,CONE,RADFL(50),RADR(40),RADS(40),IRAD                             ENTR-MOD
       COMMON/WALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPW( 8,40, 1)           B02A   7
      1,RHOVW(40, 1),FLUXJ( 3,40, 1),IHW,ITW,IFW,ISPW,IRHOVW,IFLUXJ        B02A   8
     1 FORMAT(A1)
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```
      DATA IAST/1H,/
      DATA LAST/1H./
      DATA IBLANK/2H  /
      KIN=5                                                          ENTR-MOD
      KOUT=6                                                         ENTR-MOD
      JTIME=1
      B(1)=.5                                                        BLIM 015
      B(2)=.333333333                                                BLIM 016
      B(3)=.166666666                                                BLIM 017
      B(4)=.125                                                      BLIM 018
      B(5)=.041666666                                                BLIM 019
      B(6)=.033333333                                                BLIM 020
      B(7)=.013888888                                                BLIM 021
      B(8)=.003968254                                                BLIM 022
      IT=1                                                           BLIM 023
   46 MWE=-1
      NBT=13                                                         ENTR-MOD
      NBT2=14                                                        ENTR-MOD
      IS=1                                                           BLIM 025
      IU=1                                                           ENTR-MOD
   41 ITEM=1                                                         BLIM 026
   42 CALL SETUP                                                     BLIM 027
   43 CALL ITERAT                                                    BLIM 031
      CALL OUTPUT                                                    BLIM 032
      IF (IDENT.EQ.IBLANK) GO TO 55
      CALL FELTRU
   55 CONTINUE
      IF(NON)43,44,40                                                BLIM 033
   44 ITEM=ITEM+1                                                    BLIM 034
      IF(ITEM-NITEM) 42,42,45                                        BLIM 035
   45 ISH=IS                                                         ENTR-MOD
      IU=IU+1                                                        ENTR-MOD
   49 IS=IS+1                                                        ENTR-MOD
      IF(KQ(10)+IS.EQ.-10)KQ(10)=1                                   ENTR-MOD
      IF(IDISC(IS).EQ.2)GO TO 49                                     ENTR-MOD
      IF(IS-NS) 41,41,40                                             BLIM 037
   40 READ(KIN,1) JAST
      IF(IAST-JAST) 47,46,47
   47 IF(LAST-JAST) 40,48,40
   48 STOP
      END                                                            BLIM 038
CB03A                                                                B03A 001
      SUBROUTINE SETUP                                               B03A 002
      DIMENSION HIST1(605),HIST2(607),HIST3(511),VMAT(566),HIST4(600)  B03A 003
      COMMON/BLQCOM/  MOA( 71),  MOB( 71),NSPEC,FR( 71,15),W(3),LEF(10) B03A   4
     1,LEFS(10),PIEASE,LEFW(10)                                      B03A   5
      COMMON/EDGCOM/            PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,B03A   6
     1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMWE,CGE,C90  ENTR-MOD
     2,DSIP(40),IDSIP,TTVC,TVCC(40),HEA(40),SF(20),CS(20),CSPR(20),     ENTR-MOD
     3CG(20),CGP(20),SREF,GEP,NEN,UINF,RHOINF,HINF,PINF                 ENTR-MOD
      COMMON/FLPCOM/TXI(2),TUE(2),TRHOE(2),TTE(2),TVMUE(2),TMAT(566,2)  B03A   9
     2,THF(15,2),LEFT(10,2),TPE(2),TRADS(2),TDSIP(2),KQT(2)             B03A  10
      COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8B03A  11
     1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HMUE,HFW,DLX2  B03A  12
     2,C3M(40),BETAM(40)                                                B03A  13
      COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB03A  14
     1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B03A  15
     2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B03A  16
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175           3,KAUXO,JTIME,JSPEC,MD(3),IU,ISH                                  ENTR-MOD
176            COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) B03A  18
177           1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO,  B03A  19
178           2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                            B03A  20
179            COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                    B03A  21
180            COMMON/WALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPW( 8,40, 1)         B03A  22
181           1,RHOVW(40, 1),FLUXJ( 3,40, 1),IHW,ITW,IFW,ISPW,IRHOVW,IFLUXJ     B03A  23
182            EQUIVALENCE(HIST1,XI),(HIST2, PE),(HIST3,F),(VMAT,C1),(HIST4,FW)  C03A 008
183          2 FORMAT(1H18X4HTIMEE12.5,56H SECONDS - - - - - - - - - - - - - - - C03A 022
184           1- - - - - - - - -,2X3A6)
185          3 FORMAT(/1H17X4HTIMEE12.5,35H SECONDS - - - STREAMWISE DIMENSI(NE12C03A 024
186           1.5,11HFEET - - -,2X3A6)
187          4 FORMAT(1H18X4HCASEI3,32(2H -)2X3A6)
188          5 FORMAT(1H17X4HCASEI3,11(2H -)21H STREAMWISE DIMENSIONE12.5,13H FEE
189           1T - - - -3A6)
190       9901 FORMAT(I3,7E10.3)                                                 C03A 026
191            DATA MD(2)/6H      /
192            MD(1)=MD(2)
193            MD(3)=MD(2)
194            CALL ETIME
195            CALL DATE(9,MD)
196            CALL TOD(18,MD)
197            KR(2)=2
198            J=MOD(ITEM,2)+1                                                   C03A 028
199            IF(MWE)101,154,154                                                C03A 029
200       C    INPUT CONTROL AND TITLE CARD, NUMBER OF ELEMENTAL SPECIES TO BE   C03A 030
201       C    CONSIDERED, TIMES AND BODY POSITIONS TO BE CALCULATED, AND        C03A 031
202       C    REFERENCE CONDITIONS(WHEN GIVEN AT THESE PRECISE TIMES AND BODY   C03A 032
203       C    POSITIONS                                                         C03A 033
204         101 CALL RECASE                                                      C03A 034
205            KQ(10)=0
206            IF(KR(7).GT.1) CALL TRMBL(1)
207            IS=1                                                              C03A 037
208            IT=1                                                              C03A 038
209       C    INPUT ETA VALUES AND SET UP AND INVERT LINEAR MATRICES.NOTE..KR(1)C03A 039
210       C    MUST BE UNITY FOR FIRST CASE, BUT FORMATION OF BA1 AND BA2 CAN BE C03A 040
211       C    AVOIDED FOR SUBSEQUENT CASES BY SETTING KR(1) EQUAL TO ZERO. THIS C03A 041
212       C    CAN BE DONE IF AND ONLY IF ETA SPACING IS THE SAME                C03A 042
213            IF(KR(1)) 104,104,103                                             C03A 043
214         103 CALL LINMAT                                                      C03A 044
215         104 KR17=KR(17)                                                      C03A 045
216         154 IF(IS+ITEM-2) 105,105,1572
217        1572 IF(KR(3)) 1570,1577,1570
218        1570 DO 1573 K=1,10                                                   ENTR-MOD
219             IF(LEF(K)-1) 1573,1575,1573                                      C03A 049
220        1575 LEF(K)=2                                                         C03A 050
221        1573 CONTINUE                                                         C03A 051
222        1577 IF(NITEM-1) 1574,107,1574                                        C03A 052
223        1574 WRITE(NBT)HIST1,HIST2,HIST3,HIST4,M,LEF,RADS,KQ(10)
224             IF(ITEM-1) 157,156,157                                           C03A 054
225         156 IDUM=NBT                                                         C03A 055
226             NBT=NBT2                                                         C03A 056
227             NBT2=IDUM                                                        C03A 057
228             DO 153 I=1,NITEM
229         153 BACKSPACE NBT2
230             GO TO 155                                                        C03A 060
231         157 IF(IS-1) 105,105,155
232         155 READ(NBT2)HIST1,HIST2,HIST3,HIST4,M,LEF,RADS,KQ(10)
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      GO TO 107                                                                 C03A 063
C     INITIAL GUESSES FOR PRINCIPAL DEPENDENT VARIABLES. CALCULATE(KR(2)        C03A 066
C     =0), INPUT(KR(2)=1), OR USE VALUES FROM FROM PREVIOUS CASE(KR(2)          C03A 067
C     =2). NOTE..LATTER REQUIRES SAME ETA VALUES AND SAME SPECIES. ITS          C03A 068
C     UTILITY IS FOR REPEATED SIMILARITY SOLUTIONS. IT OBVIOUSLY  CANNOT        C03A 069
C     BE USED FOR FIRST CASE.                                                   C03A 070
  105 CALL FIRSTG                                                               C03A 071
      IF(TIME(1)) 1051,1052,1052
 1051 ITAB=ABS(TIME(ITEM))
      WRITE(KOUT,4) ITAB, MD
      GO TO 106
 1052 WRITE(KOUT,2) TIME(ITEM),MD
  106 IF(KR(7))204,204,203
  203 IF(KR(12).NE.1) CALL STATEN
      GO TO 202
  204 IF(KR(12).NE.1) CALL INPUT(PTET(1))
  202 CALL REFCON
      IF(KQ(9).NE.0) CALL TRANCR(1)
      KR(12)=1                                                                  C03A 076
      IS=1                                                                      C03A 077
  107 DO 1262 I=1,10                                                            ENTR-MOD
      IF(IS.EQ.1.AND.LEF(I).EQ.2.AND.KR(2).GE.0)LEF(I)=1                        ENTR-MOD
 1262 LEFT(I,J)=LEF(I)                                                          C03A 088
C-----COMPUTE HISTORIC INFORMATION
      CALL HISTXI
      IF(TIME(1)) 1053,1054,1054
 1053 ITAB=ABS(TIME(ITEM))
      WRITE(KOUT,5) ITAB, S(IS), MD
      GO TO 126
 1054 WRITE(KOUT,3)TIME(ITEM),S(IS),MD
  126 DO 1261 I=1,META
 1261 THF(I,J)=HF(I,5)                                                          C03A 085
      TXI(J)=XI(IS)                                                             C03A 086
      TRADS(J)=RADS(IS)
      TDSIP(J)=DSIP(IS)
      TUE(J)=UE(IS)                                                             C03A 087
      TRHOE(J)=RHOE(IS)                                                         C03A 088
      TTE(J)=TE(IS)                                                             C03A 089
      KQT(J)=KQ(10)
      TVMUE(J)=VMUE(IS)                                                         C03A 090
      DO 104 I=1,966                                                            C03A 091
  104 TMAT(I,J)=VMAT(I)                                                         C03A 092
      TPE(J)=PE(IS,1)                                                           C03A 093
      NNE=0                                                                     C03A 094
C     START OF ITERATION LOOP                                                   C03A 095
  150 ITS=0                                                                     C03A 096
      KR(17)=KR17                                                               C03A 097
  199 RETURN                                                                    C03A 098
      END                                                                       C03A 099
C804A                                                                           804A 001
      SUBROUTINE ITERAT                                                         804A 002
      COMMON/BLOCON/  NDA( 71),  NDB( 71),NSPEC,FR( 71,15),W(3),LEF(10)  804A   3
     1,LEFS(10),PLEASE,LEFM(10)                                                 804A   4
      COMMON/BURCON/    BUMP,CORRA,EASE,ICORR,WDOT,TFZ,I777,DTEMP,KIP,IX 804A   5
      COMMON/ERRCON/PLE( 43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEM       804A   6
     1,SPLEM( 8),ELM(14),ELMM,IFLM,IGLM,ISPLM( 8),NELM,ILMM,DFL(43)       804A   7
     2,DGL(30),DSPL(30, 8),FMLE(10),GMLE(15),SPMLE(15, 8),EML(153)        804A   8
     3,FMLEM,GMLEM,SPMLEM( 8),          EMLMM,IFMLM,IGMLM,ISPMLM( 8)     804A   9
```

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      4,NENLM,INLMM,DFNL(18),DGNL(15),DSPNL(15, 8),DRNL(10)                B04A  10
       COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,META,I,IS,NB04A  11
      1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B04A  12
      2,B(6),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B04A  13
      3,KAUXO,JTIME,JSPEC,MD(3)                                            B04A  14
       COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40)   B04A  15
      1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADKO,    B04A  16
      2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                              B04A  17
       COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                      B04A  18
     5 FORMAT(I3,1X,F8.3,F6.3,F7.4,F6.4,1PE7.0,8(I3,E8.1))
     6 FORMAT(/1X15HITERATED VALUES11X47HDAMP  MAX.LIN   MAX.ERRORS IN CO
      1NSERVATION EQS./1X58HITS    TIME   ALPH   FPPW          ERROR  MOMEN
      1TUM    ENERGY 6(5XA4,A2))
     1 FORMAT(22H NON-CONVERGENT OUTPUT)                                   B04A 018
   101 ITS=ITS+1                                                           B04A 019
       JTIME=MAXO(JTIME,0)
       CALL TLEFT(ILEFT)                                                   RDG
       IF(ILEFT-JTIME) 30,30,31
    30 JTIME=-JTIME
       KR(4)=1                                                             RDG
       KR(16)=1                                                            RDG
       KR(18)=1                                                            ENTR-MOD
       KR(19)=1                                                            ENTR-MOD
    31 CONTINUE                                                            RDG
       NON=2
   323 IF(ITS-5) 328,328,321
   320 IF(KR(2)) 325,321,321
   321 IF(KQ(10)+10) 326,322,326
   326 IF(NON-2) 325,330,325
   325 RETURN
   322 KQ(10)=2
       IDISC(IS)=1
       EASE=0.11
       ITS=2
       WRITE(KOUT,324)
   324 FORMAT(96H1     PRIOR LAMINAR SOLUTION AFTER TRANSITION. TURBULENCE
      1 WILL BE INCLUDED AND SOLUTION CONTINUED //)
   328 IF(NON) 325,330,330
   330 NON=0                                                               ENTR-MOD
       CALL NONCER                                                         B04A 021
       CALL ETIMEF(TIMD)
       FPPW=F(3,1)/(ALPH*ALPH)                                             B04A 022
       IF(KQ(18).EQ.2) GO TO 1900
       IF(KR(4)+KR(16)+KR(17)+KR(18)/2+KR(19)+KR(20)+NON) 189,189,1901
   189 IF (ITS-1) 1901,1901,1911                                           B04A
  1900 KQ(10)=1
  1901 IF (NSPM1) 192,192,190                                              B04A
   190 WRITE(KOUT,6) (MOA(K),MOB(K),K=1,NSPM1)                             B04A 025
       GO TO 191
   192 WRITE(KOUT,7)
       GO TO 194
  1911 IF (NSPM1)194,194,191
   191 WRITE(KOUT,5)ITS,TIMD,ALPH,FPPW,EASE,ELMM,IFNLM,FNLEM,IGNLM,GNLEM,
      1(ISPNLM(K),SPNLEM(K),K=1,NSPM1),NON
       GO TO 1920
   194 WRITE(KOUT,5)ITS,TIMD,ALPH,FPPW,EASE,ELMM,IFNLM,FNLEM,IGNLM,GNLEM
  1920 IF(KR(2)) 162,1921,1921
  1921 IF(ENLMM+ELMM-0.0002) 162,162,159
```

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      7 FORMAT(/7X65HITERATED VALUES    DAMP   MAX.LIN   MAX.ERRORS IN CONSE
     1RVATION EQS./1X58HITS  TIME    ALPH   FPPW        ERROR    MOMENTUM
     2    ENERGY   )
    162 NON=0                                                              B04A 029
        GO TO 329
    159 IF(ITS-50) 161,160,160                                             B04A 031
    160 WRITE(KOUT,1)                                                      B04A 032
        IF (ELMM+ENLMM-.02) 162,162,1601                                   B04A 033
   1601 NON=1                                                              B04A 034
        GO TO 328
C       ITERATE OR OUTPUT                                                  B04A 036
    161 IF(KR(4)) 181,181,193                                              B04A 037
    193 NON=-1                                                             B04A 038
        GO TO 323
        END                                                                B04A 040
C       B05B
        SUBROUTINEMONCER                                                   B05A0020
        INTEGER ASU,BSU
        DIMENSIONDQJRNL( 71,1)                                             B05B 004
        DIMENSIONDELQJW(1) ,DQJNL(153,1) ,WALLCJ(1)                        B05B 005
        DIMENSIONCOEEQV(84),COEFQV(423)                                    B05B 006
        COMMON/BLQCOM/  MOA( 71),  MOB( 71),NSPEC,FR( 71,15),W(3),LEF(10) B05B   7
       1 ,LEFS(10),PIEASE,LEFW(10),L2,L3                                   ENTR-MOD
        COMMON/BUNCON/     BUNP,CORNA,EASE,ICORN,MDOT,TFZ,I777,DYEMP,KIP,IXB05B   9
        COMMON1/COECON/              C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15B05B  10
       1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31,CB05B  11
       232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48B05B  12
       3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,CB05B  13
       465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,C81B05B  14
       5,C82,C83,C84,C85,C86,C87,C88                                       B05B  15
        COMMON/COECON/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8)     B05B  16
       1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8)       B05B  17
       2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8)    B05B  18
       3,CK21( 8),CK22( 8),CKK_( 8, 8),CHK2( 8, 8),XM(5),XG(5),XSP(5, 9)   B05B  19
       4,CKK3( 8, 8)                                                       B05B  20
        COMMON/CRBCON/HCARB,EMIS,STEF,ADUM,BDUM,CDUM,HTEF,HMAT,EMISC,EMISTB05B  21
       1,HPG,ASU(3),BSU(3),HPVG(3),HCHAR(3),EMIV(3),KS(40),ISU             B05B  22
        COMMON/EDGCON/              PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,B05B  23
       1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMNE,CGE,C90   ENTR-MOD
       2,DSIP(40),IDSIP,TTVC,TVCC(40),MEA(40),SF(20),CS(20),CSPR(20),       ENTR-MOD
       3CG(20),CGP(20),SREF,GEP,MEN,UINF,RHOINF                            ENTR-MOD
        COMMON/EPSCON/ELCON,YAP,CLNLM,SCT,PRT,RED,DVS,RHOVS,PI,PIM,CL,     B05B  26
       1 EPSA(15),EPSI,EL(15),DPI(15,2),DEPC,TREF,RETR,VINTR(15)           ENTR-MOD
        COMMON/EQPCON/  RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2),B05B  28
       1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),MAT(10),   B05B  29
       2 KAT(10),IR(10),IZ,KZ(10),LAMI( 71),P,Z,TK(10, 7),VM( 71),         B05B  30
       3 VMU( 71,10),ITFF,KR2,MCM,NCV,MM,MTM( 71),YYY( 71),VM( 71),GG( 71)B05B  31
       4 ,TQ(10, 7),EPOVRK,SIGMA,BASMOL                                    B05B  32
        COMMON/EQTCON/SIP,MIP,EEL,EEML,FLIQ,CPF,IRE,IER,AA,IITS,IN,IL,IIT,B05B  33
       1 MODE,MMELT,SMELT,TMAX,TMIN,MELT,SUMM,SUML,MS,MSS,BX,ISP2,ISPO,    B05B  34
       2 ISP,KKJ,SVA,SVB,SVC,SVD,SUMC,FFF,CMF,EP,RV,IFCJC,MTG,MTL,JC,MMG,  B05B  35
       3 CCPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),BB(16),     ENTR-MOD
       4 IP( 71),ALP(10),FMU(10),GAMM(10),SLAM(10),DY( 71),RIS,            B05B  37
       5 CP( 71),MM( 71),SB( 71),TC( 71),VLMK( 71),E( 71),PMUS(10),       B05B  38
       6 UC(10),BLMK(10),BY(10),IBC(10),BE(10),JZ( 4)                      B05B  39
        COMMON/ERRCON/FLE( 43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEP      B05B  40
       1,SPLEM( 8),ELM(14),ELMM,IFLR,IGLM,ISPLM( 8),MELM,ILMM,DFL(43)      B05B  41
       2,DGL(30),DSPL(30, 8),FMLE(12),GMLE(15),SPMLE(15, 8),ENL(153)       B05B  42
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407          3,FNLEM,GNLEM,SPNLEM( 8),          ENLMM,IFNLM,IGNLM,ISPNLM( 8)      B05B  43
408          4,NEMLM,INLMM,DFNL(18),DGNL(15),DSPNL(15, 8),DRNL(10)                B05B  44
409           COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)        B05B  45
410          1,LAR(153),BA1(43,18),BA2(30,15)                                     B05B  46
411           COMMON/FLXCOM/DELQW,DELJW( 8),DQNL(153),DJNL(153, 8),WALLQ          B05B  47
412          1,WALLJ( 8),QW,VJKW( 9),TPWALL                                       B05B  48
413           COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8)B05B  49
414          1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HHUE,HFW,DLX2   B05B  50
415          2,C3M(40),BETAM(40)                                                  B05B  51
416           COMMON/INTCOM/ KR(20),XIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB05B  52
417          1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B05B  53
418          2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NDT,NBT2,IDENT,KR9(40)  B05B  54
419          3,KAUXQ,JTIME,JSPEC,MO(3),IU,ISW                                     ENTR-MOD
420           COMMON/NONCOM/AM(153,153),DWNL(153),TCW,                            B05B  56
421          1VLNKW,DLPH( 9),DLPK( 8, 9),DTHW,DTKW( 8),FLUXJB( 9)                 B05B  57
422           COMMON/PRMCOM/TIME(50),PRE(40),PTET(50),GE(50),S(40),ROKAP(40)      ENTR-MOD
423           COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15)     B05B  58
424          1,CPBAR(15),VMW(15),PHIK(15, 8),DRHOW,DRHOK( 8),ZK( 8),DZKW( 8),  DB05B  59
425          2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKW( 8),DPRK( 8),DSCK( 8),DCAPCK( 8)B05B  60
426          3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)     B05B  61
427          4,DPHIKK( 8, 8),      DMU4W,DMU3W,DHTILW,VMU12,CT,CTR,CPTIL,HTIL     B05B  62
428          5,VMU3,DTW,DCAPCW,DPRW,DSCW,DQRW,DCPBW,DCPTW,DMU12W,VMU(15),  RHOF  B05B  63
429          6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15)     B05B  64
430           COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                      B05B  65
431           COMMON/WALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPW( 8,40, 1)           B05B  66
432          1,RHOVW(40, 1),FLUXJ( 3,40, 1),IWW,ITW,IFW,ISPW,IRHOVW,IFLUXJ        B05B  67
433           DIMENSION ENLM(1),IENLM(1)
434           EQUIVALENCE (ENLM(1),FNLEM),(IENLM(1),IFNLM)
435           EQUIVALENCE(DELQW,DELQJW),(DQNL,DQJNL),(WALLQ,WALLQJ)               B05A0380
436           DIMENSIONCORAR(1)                                                   B05A0470
437           EQUIVALENCE(CORAR(1),AM(1))                                         B05A0480
438           EQUIVALENCE(AM,DQJRNL)                                              B05A0490
439           DIMENSION PREQ(1)
440           DIMENSION ZEIT(9)
441           EQUIVALENCE(PREQ(1),DRHOW)                                          B05B
442           EQUIVALENCE(C5,COEEQV),(CK1(1),COEFQV)                              B05A0680
443     C**NB***NOTE 248+1,548+1,725,730+1 WHEN REDIMENSIONING                    B05A0690
444           EASE=AMIN1(EASE**2.,1.0)
445           IF(ITS-1) 11,5,11
446         5 EASE=0.05
447           BUMP = 1.8                                                          B05A0740
448           IF(ITEM+IL-2) 3,3,2                                                 ENTR-MOD
449         2 IF(WCOT) 4,3,3
450         3 WOOT=-.12/C1
451         4 PIEASE=1.
452           ICORR = 1                                                           B05A0760
453           CORRA = 1.E + 10                                                    B05A0770
454           TFZ = 0.                                                            B05A0780
455           IF (KR9(IS)) 8,8,7
456         7 KR(9)=KR9(IS)
457         8 DO 17 I=1,NETA
458        17 EPSA(I)=0.
459           IF(KR(9)-2) 11,10,9
460         9 FLUXJ(3,IS,IT)=-1.                                                  B05A0705
461        10 ISP=IZ+1
462           KK=MAX0(1,KS(IS))
463           W(1) = FLUXJ(1,IS, IT)
46            W(2)=FLUXJ(2,IS,IT)
```

```
      H(3)=FLUXJ(3,IS,IT)
      L2=2*KK
      L3=L2+1
      IF(KR(9)-2) 11,11,16
   16 HPG=HPYG(KK)
      EMISC=EMIV(KK)
      HCARB=HCHAR(KK)
      DO 12 J=ISP,NSPEC
      IF(HOA(J)-ASU(KK)) 12,13,12
   13 IF(HOB(J)-BSU(KK)) 12,14,12
   14 ISU=J
      GO TO 11
   12 CONTINUE
      ISU=ISP
   11 KIP=0
      IX = 0
C---- EVALUATE COEFFICIENTS AND ERRORS FOR NONLINEAR EQUATIONS                  805A0810
C     INITIALIZE AM MATRIX                                                      805A0830
      DO 19 I=1,NNLEQ                                                          805A0840
      ENL(I)=0.                                                                805A0850
      DO 15 J=1,NNLEQ
   15 AM(I,J) = 0.                                                             805A0860
C     EVAL. GROUPINGS WHICH CHANGE DURING ITERATION BUT ARE NOT F(ETA)          805A0870
   48 C5 = 1. / ALPH                                                           805A0880
      DUM1 = ALPH * ALPH                                                       805A0940
      C6 = BETA * DUM1                                                         805A0950
      C7 = - UE(IS) / DUM1 * UE(IS) / 25036.5                                  805A0960
      C8 = ALPHO * C5                                                          805A0970
      C9 = C4 - C8                                                             805A0980
C     FINALLY, EVAL CONTRIBUTIONS TO AM AND ERRORS FROM OTHER COEFFS            805A0990
C---- START OF MAJOR DO LOOP FOR EVAL OF COEFFS AND ERRORS AT EACH ETA          805A1140
      KQ(1)=2                                                                  805A1290
      KQ(5)=0
      CALL ETIMEF(ZEIT(1))
      DO 49 I=1,NETA
      H(I)=G(1,I)+0.5*F(2,I)*C7*F(2,I)
      HP=G(2,I)+F(2,I)*C7**F(3,I)
      IF(KR(7)) 47,47,46
   46 CALL STATE
      GO TO 48
   47 CALL EQUIL(KQ,H(I),PE(IS,IT))
   48 IF(I-1) 50,50,54
   50 IF(NSPM1) 53,53,51
   51 DO 52 K=1,NSPM1
      DO 31 KK=1,IZ
   31 DLPK(K,KK) = A(KK+2, K+2)                                                ENTR-H00
   52 DTKM(K)= DTK(K)
      DO 32 KK=1,IZ
   32 DLPM(KK)= A(KK+2,1)                                                      ENTR-H00
      VLNKM=VLNK(ISU)
      TCM=TC(ISU)
      HCHAL = NN(ISU)/WTN(ISU)*1.8
   53 DTHM=DTH
   54 RHOP(I)=-DRHOH*HP
      IF(NSPM1) 58,58,56
   56 DO 57 K=1,NSPM1
   57 RHOP(I)=RHOP(I)+DRHOK(K)*SP(2,I,K)
   58 L=0
```

```
523           M=MAT1J+I-MAT2J
524     C-----UPPER LIMIT IS MAX NUMBER OF SPECIES (NXNSP) =LAST DIM ON SP
525           DO 49 MM=1, 9                                                  8058
526           M=M+MAT2J
527     C-----UPPER LIMIT CORRESPONDS TO DIMENSIONS ON AM ARRAY
528           DO 49 N=124,153                                                8058
529           L=L+1
530        49 AM(M,N)=PREQ(L)
531           CONJ=25836.5                                                   ENTR-MOD
532           UEDGE=1.                                                       ENTR-MOD
533           DUEDGE=0.                                                      ENTR-MOD
534           GEP=0.                                                         ENTR-MOD
535           CGE=0.                                                         ENTR-MOD
536           CGEP=0.                                                        ENTR-MOD
537           DUM=-RHOE(IS)*ROKAP(IS)*C3*VMUE(IS)                            ENTR-MOD
538           SFE=DUM*F(1,NETA)*UE(IS)                                       ENTR-MOD
539           IF(KR(5)-2) 486,487,486                                        ENTR-MOD
540        487 IF(XI(IS)) 488,489,488                                        ENTR-MOD
541        489 FEDGE=-RHOINF/2.*UINF/(RHOE(IS)*C3*VMUE(IS)*DUES)            ENTR-MOD
542           GO TO 497                                                      ENTR-MOD
543        488 FEDGE=RHOINF/DUM*UINF/UE(IS)*(ROKAP(IS))**2/2.               ENTR-MOD
544        497 SFE=FEDGE*DUM*UE(IS)                                          ENTR-MOD
545        486 IF(KR(5)-4) 498,496,499                                       ENTR-MOD
546        498 IF(KR(5)-2) 499,491,491                                       ENTR-MOD
547        496 CALL OGLE (1,SFE,CGE,CGEP,NEN,SF,CG,CGP)                      ENTR-MOD
548        491 CALL OGLE (1,SFE,CSE,CSEP,NEN,SF,CS,CSPR)                     ENTR-MOD
549           DUB=CSE+SREF-SIP                                               ENTR-MOD
550           CHE=1.8*HIP+T(NETA)*DUB*(1.+0.5*DTH*DUB)-HEA(IS)               ENTR-MOD
551           CTE=T(NETA)*(1.+DTH*DUB)                                       ENTR-MOD
552           CHEP=CTE*CSEP                                                  ENTR-MOD
553           IF (XI(IS)) 492,492,495                                        ENTR-MOD
554        492 IF(KR(6)-1) 493,494,494                                       ENTR-MOD
555        493 DUEDGE=-RHOE(IS)/DUES*(CGEP-CHEP)*C3*VMUE(IS)*CONJ            ENTR-MOD
556           UEDGE=SQRT(1.+2.*DUEDGE*F(1,NETA))                             ENTR-MOD
557           GEP=0.                                                         ENTR-MOD
558           GO TO 499                                                      ENTR-MOD
559        494 GPP=(CGP(2)-CGP(1)+CTE*(CSPR(2)-CSPR(1)))/(SF(2)-SF(1))       ENTR-MOD
560           DUEDGE=GPP*DUM*DUM*F(1,NETA)*CONJ                              ENTR-MOD
561           UEDGE=SQRT(1.+DUEDGE*F(1,NETA))                                ENTR-MOD
562           GEP=0.                                                         ENTR-MOD
563           GO TO 499                                                      ENTR-MOD
564        495 UEDGE=SQRT(1.+2.*CONJ/UE(IS)*(CGE-CHE)/UE(IS))                ENTR-MOD
565           GEP=DUM*UE(IS)*CGEP*UEDGE                                      ENTR-MOD
566           DUEDGE=DUM/UE(IS)*(CGEP-CHEP)*CONJ                             ENTR-MOD
567        499 DUF=DUEDGE/UEDGE                                              ENTR-MOD
568           CGE=CGE+GE(ITEM)                                               ENTR-MOD
569           CALL LINCER                                                    ENTR-MOD
570           CALL ETIMEF(ZEIT(2))
571           IF(KQ(10).GT.0) CALL TRMDL(2)
572           CALL ETIMEF(ZEIT(3))
573           TTVC=1.0
574           DO 120 I=1,NETA                                                8858A388
575           L=0
576           M=MAT1J+I-MAT2J
577     C-----UPPER LIMIT IS MAX NUMBER OF SPECIES   (MXNSP) LAST DIM ON SP
578           DO 59 MM=1, 9                                                  8058
579           M=M+MAT2J
580     C-----UPPER LIMIT CORRESPONDS TO DIMENSIONS ON AM ARRAY
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      DO 59 N=124,153                                                    B05B
      L=L+1
      PREQ(L)=AM(M,N)
   59 AM(M,N)=0.
C     TEST TO BYPASS COMMANDS THAT CANNOT BE PERFORMED AT ETA(1)         B05A1310
      IF (I - 1) 60,60,55                                                B05A1320
   55 CALL IMONE                                                         B05A1330
      IF(KQ(9).NE.0) CALL TRANCR(3)
      IF(KQ(10).GT.0) CALL TRNBL(4)
C     COMPUTE STATIC ENTHALPY AND DETERMINE STATE OF GAS                 B05A1340
   60 C10 = C7 * F(2,I)                                                  B05A1350
      C13 = C7 * F(3,I)                                                  B05A1370
      HP = G(2,I) + F(2,I) * C13                                         B05A1380
C---- EVAL GROUPINGS WHICH ARE USED AT I-1 AS WELL AS AT I               B05A1460
   75 CALL ICOEFF                                                        B05A1470
      IF(KQ(9).NE.0) CALL TRANCR(2)
      IF(KQ(10).GT.0) CALL TRNBL(3)
      IF (I - 1) 100,80,100                                              B05A1480
C     DLPK,TCN,VLNKM,DLPM, AND Y1 NEEDED ONLY FOR CARBON PROBLEM         B05A1490
   80 IF (NSPM1) 95,95,85                                                B05A1500
   85 DO 90 K=1,NSPM1                                                    B05A1510
      WALLJ(K) = CK6(K)                                                  B05A1520
      VJKW(K) = CK6(K) / C3                                              B05A1530
   90 CONTINUE
   95 WALLQ = C32                                                        B05A1620
      QW = C32 / C3                                                      B05A1630
      IPWALL = TP
      GOTO 105                                                           B05A1640
C---- BACK TO CONSERVATION EQUATIONS                                     B05A1650
  100 CALL IONLY                                                         B05A1660
      IF(KQ(10).GT.0) CALL TRNBL(5)
      IF(KQ(9).NE.0) CALL TRANCR(4)
  105 IF (KR(17)) 120,120,115                                            B05A1670
  110 FORMAT(21H ALL THE COEFFICIENTS/(1X1P12E10.3))                     B05A1680
  115 WRITE(KOUT,110)C1,C2,C3,C4,COEEQV,COEFQV                           B05A1690
      IX = - 2                                                           B05A1700
  120 CONTINUE                                                           B05A1710
      DO 121 I=2,4                                                       ENTR-MOD
      DO 121 J=1,NMLEQ                                                   ENTR-MOD
  122 AM(I,J)=0.                                                         ENTR-MOD
      ENL(4)=-(ALPH*UEDGE-F(2,NETA))                                     ENTR-MOD
      AM(4,1)=UEDGE                                                      ENTR-MOD
      AM(4,MAT1J)=-1.                                                    ENTR-MOD
      CALL LIAD(-1,4,NETA-1,ALPH*DUF)                                    ENTR-MOD
      ENL(3)=-F(2,1)                                                     ENTR-MOD
      AM(3,4)=1.                                                         ENTR-MOD
      IF(KR(9)-2) 123,121,123                                            ENTR-MOD
  121 ENL(2)=F(1,NETA)-FEDGE*TTVC                                        ENTR-MOD
      CALL LIAD(-1,2,NETA-1,-1.)                                         ENTR-MOD
      GO TO 124                                                          ENTR-MOD
  123 ENL(2)=CBAR*F(2,NETA)-F(2,KAPPA)                                   ENTR-MOD
      IF(KR(5).GT.1.AND.KR(5).NE.5)ENL(2)=ENL(2)-CBAR*F(3,NETA)*(ETA(NET ENTR-MOD
     1A)-ETA(KAPPA))                                                     ENTR-MOD
      AM(2,KAPPA+3)=1.                                                   ENTR-MOD
      AM(2,MAT1J)=-CBAR                                                  ENTR-MOD
      IF(KR(5).GT.1.AND.KR(5).NE.5)CALL LIAD(-1,2,NETA+NETA-2,CBAR*(ETA( ENTR-MOD
     1NETA)-ETA(KAPPA)))                                                 ENTR-MOD
  124 CALL ETIMEF(ZEIT(6))                                               ENTR-MOD
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639           IF (ITS - 1) 125,125,145                                          B05A1720
640         125 DO 140 K=1,NSP                                                  B05A1730
641           IF (LEFS(K)) 130,130,140                                          B05A1740
642         130 IF(LEF(K)) 140,140,135
643         135 EASE = .05                                                      B05A1760
644         140 CONTINUE                                                        B05A1770
645         145 IF(KR(19)) 170,190,170                                          B05A1850
646         170 CONTINUE                                                        B05A1860
647           WRITE(KOUT,175)                                                   B05A1870
648         175 FORMAT(2X21HDEBUG FNLE,GNLE,SPNLE)                              B05A1880
649         180 FORMAT(/2X1P11E10.3/(12X1P10E10.3))                             B05A1890
650           WRITE (KOUT,180) (ENL(I),I=1,NNLEQ)
651       C     SEEK MAXIMUM ERROR FOR EACH CONSERVED QUANTITY
652         190 M=2
653           MM=MAT1J
654           DO 200 I=1,NRNL
655           CALL ABMAX(MM-1,ENL(M),ENLM(I),IENLM(I))
656           IENLM(I) = IENLM(I)+1
657           M=M+MM
658         200 MM=MAT2J
659       C     SOLVE REDUCED SET OF EQUATIONS                                  B05A2070
660           IF (KR(2).LT.0) RETURN
661       C     SCRUNTCH DEFINED ROWS OF AM MATRIX TO THE TOP                   B05A2090
662           LSKIP=MAT1J+1                                                     B05A2100
663           L=1                                                               B05A2110
664           LL=0
665           DO 240 M=1,NAM                                                  B05A2130
666           L=L+1                                                             B05A2140
667           IF(L-LSKIP) 235,230,235
668         230 LSKIP=LSKIP+MAT2J
669           LL=LL+1
670           DO 231 J=1,NNLEQ
671         231 DQJNL(J,LL)=AM(L,J)
672           DELQJW(LL)=-ENL(L)
673           L=L+1
674         235 ENL(M)=ENL(L)
675           DO 240 J=1,NNLEQ
676         240 AM(M,J)=AM(L,J)                                                 B05A2180
677       C     THE FOLLOWING ROUTINE REARRANGES COLUMNS OF THE NOW RECTANGULAR  B05A2250
678       C     AM MATRIX,ACCORDING TO LAR,INVERTS((AM(I,J),J=2,NAM),I=1,NAM) AND B05A2260
679       C     MULTIPLIES THE INVERSE TIMES THE REMAINING COLUMNS OF AM MATRIX  B05A2270
680       C     AND TIMES THE ENL.                                              B05A2280
681           CALL ETIMEF(ZEIT(5))
682           CALL RERAY(NAM,AM,NSP - 1,ENL,1,LAR,IX,153)                       B05A2290
683           CALL ETIMEF(ZEIT(6))
684           DO 243 I=1,NAM
685         243 AM(I,NAM)=AM(I,1)
686         244 IF(KR(17)) 245,265,245
687         245 CONTINUE                                                        B05A2310
688         250 FORMAT(2X1P11E10.3)                                             B05A2320
689           WRITE(KOUT,255)                                                   B05A2330
690         255 FORMAT(2X18HDEBUG FLE,GLE,SPLE)                               B05A2340
691           WRITE(KOUT,250)FLE,GLE                                            B05A2350
692           IF (NSPM1) 265,265,260                                            B05A2360
693         260 WRITE(KOUT,250)((SPLE(I,K),K=1,NSPM1),I=1,MAT2I)                B05A2370
694       C*****SURFACE OPTIONS TREATED IN RNLCER WITH REDUCED NONLINEAR SET
695         265 CALL ETIMEF(ZEIT(7))
696           CALL RNLCER
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      CALL ETIMEF(ZEIT(8))
C     DETERMINE MAXIMUM NONLINEAR ERRORS                                B05A4010
C     EQUIVALENCE ENLM TO FNLEM, GNLEM, AND SPNLEM                      B05A4020
  595 DO 605 I=1,NRNL
      IF(ABS(ENLM(I))-ABS(DRNL(I))) 600,605,605
  600 ENLM(I) = DRNL(I)
      IENLM(I) = 1
  605 CONTINUE
      ENLM(1)=ENLM(1)*10.
      ENLM(2)=ENLM(2)/1000.
      CALL ABMAX(NRNL,ENLM,ENLMM,INLMM)
      ENLMM=ENLMM/10.
      ENLM(1)=ENLM(1)/10.
      ENLM(2)=ENLM(2)*1000.
      ELMM = ABS(ELMM)                                                  B05A4160
      BIP = KIP
      ENLMM = ABS(ENLMM) + 3. * BIP
C     EVALUATE NONLINEAR CORRECTIONS FROM THE REDUCED SET               B05A4180
      DO 615 I=1,NAM                                                    B05A4190
      L = LAR(I)                                                        B05A4200
      DVNL(L) = ENL(I)                                                  B05A4210
      DO 615 K=1,NRNL                                                   B05A4220
      J = K + NAM                                                       B05A4230
  615 DVNL(L) = DVNL(L) - DRNL(K) * AM(I,J)                             B05A4240
      DO 620 K=1,NRNL                                                   B05A4250
      I = NAM + K                                                       B05A4260
      J = LAR(I)                                                        B05A4270
  620 DVNL(J) = DRNL(K)                                                 B05A4280
C-----RECYCLE IF ALPH WANTS TO GO NEGATIVE
      IF(DVNL(1)+0.9*ALPH) 626,626,629
  626 NUL=0                                                             ENTR-MOD
      DO 627 K=NUL,NSPM1                                                ENTR-MOD
      WALLJ(K)=VJKW(K)*C3
  627 DELQJW(K+1)=0.
      LIM=NAM+1
      DO 628 I=2,NNLEQ
      DUM=AM(I,NAM)/AM(1,NAM)
      ENL(I)=ENL(I)-ENL(1)*DUM
      DO 628 J=LIM,NNLEQ
  628 AM(I,J)=AM(I,J)-DUM*AM(1,J)
      ENL(1)=0.
      DO 631 J=LIM,NNLEQ
  631 AM(1,J)=0.
      ITS=ITS+1
      EASE=AMIN1(EASE,0.2)                                              ENTR-MOD
      IF(ITS-51) 244,244,850
  629 CONTINUE
C-----EVALUATE LINEAR CORRECTIONS                                       B05A4300
      DO 630 I=1,MAT1I                                                  B05A4310
      DO 630 J=1,MAT1J                                                  B05A4320
  630 FLE(I) = FLE(I) - DVNL(J) * BA1(I,J)                              B05A4330
      JJ = MAT1J                                                        B05A4340
      DO 635 J=1,MAT2J                                                  B05A4350
      JJ = JJ + 1                                                       B05A4360
      DO 635 I=1,MAT2I                                                  B05A4370
  635 GLE(I) = GLE(I) - DVNL(JJ) * BA2(I,J)                             B05A4380
      CORAR(1)=DVNL(1)/ALPH*0.5
      L=NETA
```

```
      J=MAT1J+2
      DO 640 I=2,NETA
      CORAR(I)=DVNL(J)/10000.
  640 J=J+1
      IF (NSPM1) 665,665,645
  645 DO 660 K=1,NSPM1                                              B05A4430
      DO 650 J=1,MAT2J                                              B05A4440
      JJ = JJ + 1                                                   B05A4450
      DO 650 I=1,MAT2I                                              B05A4460
  650 SPLE(I,K) = SPLE(I,K) - DVNL(JJ) * BA2(I,J)                   B05A4470
      J=MAT1J+K*MAT2J+2                                             B05A4480
      DO 655 I=2,NETA
      L = L + 1                                                     B05A4510
      CORAR(L)=DVNL(J)                                              B05A4520
  655 J=J+1
  660 CONTINUE
  665 CONTINUE                                                      B05A4540
      IF(EASE-0.2) 673,670,670                                      B05A4550
  670 IF(0.33+CORAR(ICORM)/CORMA) 671,675,675
  671 BUMP=BUMP*2.0
      GO TO 675
  673 IF(ABS(1.0-CORAR(ICORM)/CORMA)-0.25) 674,674,675
  674 BUMP=BUMP/2.
  675 CALL ABMAX(L,CORAR,CORMA,ICCRM)
      IF (KR(17)) 680,680,685                                       B05A4580
  680 IF (KR(19)) 690,705,690                                       B05A4590
  685 CONTINUE                                                      B05A4600
      KR(17) = KR(17) - 1                                           B05A4610
  690 CONTINUE                                                      B05A4620
  695 FORMAT(2X38HDEBUG CORRECTIONS RNL,NL,FL AND GL,SPL)           B05A4630
      CALL ETIMEF(ZEIT(9))                                          B05A4640
      WRITE(KOUT,696) ZEIT
  696 FORMAT(5X33HTIMES BEFOR AND AFTER . . . . . ./6X 9HCHEMISTRY9X
     1  13HERRORS+MATRIX9X9HINVERSION12X6HRNLCER11X3HNOW/10F10.4)
      WRITE(KOUT,695)
      WRITE(KOUT,250)DRNL                                           B05A4650
      WRITE(KOUT,250)DVNL                                           B05A4660
      WRITE(KOUT,250)FLE,GLE                                        B05A4670
      IF (NSPM1) 705,705,700                                        B05A4680
  700 WRITE(KOUT,250)((SPLE(I,K),K=1,NSPM1),I=1,MAT2I)              B05A4690
  705 CONTINUE                                                      B05A4700
C     CORRECT PRIMARY VARIABLES                                     B05A4710
      DUM = .05 / BUMP                                              B05A4720
      EASE=AMIN1(1.5*EASE,1.0,DUM/ABS(CORMA))                       B05A4730
      IF(ITS.EQ.2) BUMP=AMAX1(BUMP,.02/ABS(CORMA))
      IF(KQ(10).GT.0)EASE=AMIN1(EASE,ABS(F(3,1))/ABS(DVNL(3)+1.E-30)*.5)
  710 IF (KR(13)) 720,720,715
  715 DUM = KR(13)                                                  B05A4750
      EASE = AMIN1(DUM / 10.,EASE)                                  B05A4760
  720 IF (EASE - 1.0) 725,740,740                                   B05A4770
  725 DO 730 I=1,313                                                B05A4780
  730 FLE(I) = FLE(I) * EASE                                        B05A4790
      DO 735 I=1,153                                                B05A4800
  735 DVNL(I) = DVNL(I) * EASE                                      B05A4810
  740 CONTINUE                                                      B05A4820
      PIEASE = PIEASE * (1. - EASE)                                 B05A4830
      IF (TFZ) 745,750,750                                          B05A4840
  745 TFZ = EASE * DTEMP - TFZ                                      B05A4850
                                                                    B05A4860
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      750 NUL=0
          DFWE=F(1,NETA)-F(1,1)-XM(5)/ALPH                                  ENTR-MOD
          DO 790 I=1,NETA
          NI=NETA+I
          N2I=NETA+NI-2
          F(2,I)=F(2,I)+DVNL(I+3)
          F(4,I)=F(4,I)+FLE(N2I)
          IF(I-1) 760,760,765
      760 F(1,1)=F(1,1) + DVNL(2)
          F(3,1)=F(3,1)+DVNL(3)
          GO TO 770
      765 F(1,I)= F(1,I)+FLE(I-1)
          F(3,I)=F(3,I)+FLE(NI-2)
      770 LPI=MAT1J+I+1
          DO 785 K=NUL,NSPM1
          IF(I-NETA) 772,771,772
      771 SP(1,I,K)=SP(1,I,K)+SPLE(1,K)
          GO TO 773
      772 SP(1,I,K)=SP(1,I,K)+DVNL(LPI)
      773 SP(3,I,K)=SP(3,I,K)+SPLE(NI,K)
          IF(I-1) 775,775,780
      775 SP(2,1,K)= SP(2,1,K) + DVNL(LPI-1)
          GO TO 785
      780 SP(2,I,K)=SP(2,I,K)+SPLE(I,K)
      785 LPI=LPI+MAT2J
      790 CONTINUE
          ALPH=ALPH+DVNL(1)
          IF(KR(19).GT.0)WRITE(KOUT,250)(F(2,J),J=1,NETA),(G(1,J),J=1,NETA),ENTR-MOD
         1((SP(1,J,K),J=1,NETA),K=1,NSPM1),ALPH                             ENTR-MOD
          IF (ITS - 49) 850,840,850                                         B05A5300
      840 IF (I777 - 777) 845,850,845                                       B05A5310
      845 I777 = 777                                                        B05A5320
          ITS = 30                                                          B05A5330
      850 CONTINUE                                                          B05A5340
          IF(KQ(10).GT.-1) RETURN
          IF(KQ(10).LT.-10) RETURN                                          ENTR-MOD
          RETHMO=-C3*RHOE(IS)*UE(IS)*DFWE                                   ENTR-MOD
          IF(RETHMO.GT.RETR) KQ(10)=-10
          IF(RETHMO.LT.RETR) KQ(10)=-1
          RETURN                                                            B05A5350
          END                                                               B05A5360
C     B05C
          SUBROUTINE RNLCER
          DIMENSIONDQJRNL( 71,1)                                            B05C  003
          DIMENSIONDELQJW(1) ,DQJNL(153,1) ,WALLQJ(1)                       B05C  004
          COMMON/BLQCOM/  MOA( 71),  MOB( 71),NSPEC,FR( 71,15),W(3),LEF(10) B05C    5
         1 ,LEFS(10),PIEASE,LEFW(10),L2,L3                                  ENTR-MOD
          COMMON/BUMCOM/     BUMP,CORMA,EASE,ICORM,WDOT,TFZ,I777,DTEMP,KIP,IXB05C    7
          COMMON/CRBCOM/HCARB,EMIS,STEF,ADUM,BDUM,CDUM,HTEF,HMAT,EMISC,EMISTB05C    8
         1,HPG,ASU(3),BSU(3),HPYG(3),HCHAR(3),EMIV(3),KS(40),ISU            B05C    9
          COMMON/EDGCOM/             PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,B05C   A9
         1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,DZUEDG,VMWE,CGE,C90  ENTR-MOD
         2,DSIP(40),IDSIP,TTVC,TVCC(40),HEA(40),SF(20),CS(20),CSPR(20),     ENTR-MOD
         3CG(20),CGP(20),SREF,GEP,NEN,UINF,RHOINF,HINF,PINF                 ENTR-MOD
          COMMON/EPSCOM/ELCON,YAP,CLNUM,SCT,PRT,RED,DVS,RHOVS,PI,PIM,CL,    B05C   10
         1 EPSA(15),EPS1,EL(15),DPI(15,2),DEPC,TREF,RETR,VINTR(15)          ENTR-MOD
          COMMON/EQPCOM/  RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2),B05C   12
         1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),MAT(10),  B05C   13
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871           2 KAT(10),IR(10),IZ,KZ(10),LAMI( 71),P,Z,TK(10, 7),VN( 71),          B05C  14
872           3 VNU( 71,10),ITFF,KR2,MCH,NCV,MM,MTM( 71),YYY( 71),YW( 71),GG( 71) B05C  15
873           4 ,TQ(10, 7),EPOVRK,SIGMA,BASMOL                                     B05C  16
874            COMMON/EQTCOM/SIP,HIP,EEL,EENL,FLIQ,CPF,IRE,IER,AA,IITS,IN,IL,IIT, B05C  17
875           1 MODE,MMELT,SMELT,TMAX,TMIN,MELT,SUMN,SUML,MS,MSS,BX,ISP2,ISPQ,     B05C  18
876           2 ISP,KKJ,SVA,SVB,SVC,SVD,SUMC,FFF,CMF,EP,RV,IFCJC,MTG,MTL,JC,MMG,  B05C  19
877           3 CCPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),BB(16),      ENTR-MOD
878           4 IP( 71),ALP(10),FNU(10),GAPH(10),GAMF(10),SLAM(10),DY( 71),RVS,    B05C  21
879           5 CP( 71),MM( 71),SB( 71),TC( 71),VLNK( 71),E( 71),PNUS(10),         B05C  22
880           6 BC(10),BLNK(10),BY(10),IBC(10),BE(10),JZ( 4)                       B05C  23
881            COMMON/ERRCOM/FLE( 43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEM       B05C  24
882           1,SPLEM( 8),ELM(14),ELMM,IFLM,IGLM,ISPLM( 8),MELM,ILMM,DFL(43)      B05C  25
883           2,DGL(30),DSPL(30, 8),FNLE(10),GNLE(15),SPNLE(15, 8),ENL(153)       B05C  26
884           3,FNLEM,GNLEM,SPNLEM( 8),          ENLMM,IFNLM,IGNLM,ISPNLM( 8)     B05C  27
885           4,NENLM,INLMM,DFNL(10),DGNL(15),DSPNL(15, 8),DRNL(10)               B05C  28
886            COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),D2(14)       B05C  29
887           1,LAR(153),BA1(43,10),BA2(30,15)                                    B05C  30
888            COMMON/FLXCOM/DELQM,DELJM( 8),DQNL(153),DJNL(153, 8),MALLQ          B05C  31
889           1,MALLJ( 8),JM,VJKM( 9),TPMALL                                      B05C  32
890            COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8B05C  33
891           1 ),XI(40),MF(15,5),MG(15,3),MSP(15,3, 8),MALPM,MUE,MMJE,MFM,DLX2   B05C  34
892           2,C3M(40),BETAM(40)                                                 B05C  35
893            COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB05C  36
894           1S,IT,NTIME,NSP,NSPM1,NAM,MLEQ,MNLEQ,MRNL, IIS,KAPPA,CBAR,CASE(15) B05C  37
895           2,B(8),       MME,MCN,KQ(10),ITEM,NITEM,KR17,KBT,NBT2,IDENT,KR9(40) B05C  38
896           3,KAUXO,JTIME,JSPEC,MO(3)                                           B05C  39
897            COMMON/NONCOM/AM(153,153),DVNL(153),TCM,                           B05C  40
898           1VLNKM,DLPM( 9),DLPK( 8, 9),DTMM,DTKM( 8),FLUXJB( 9)                B05C  41
899            COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40)  B05C  42
900           1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO,    B05C  43
901           2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                             B05C  44
902            COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),M(15)     B05C  45
903           1,CPBAR(15),VMM(15),PMIK(15, 8),DRHOM,DRHOK( 8),ZK( 8),DZKM( 8),  DB05C  46
904           2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKM( 8),DPRK( 8),DSCK( 8),DCAPCK( 8)B05C  47
905           3,DMTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)    B05C  48
906           4,DPHIKK( 8, 8),      DMU4M,DMU3M,DMTILM,VMU12,CT,CTR,CPTIL,MTIL    B05C  49
907           5,VMU3,DTM,DCAPCM,DPRM,DSCM,DQRM,DCPBM,DCPTM,DMU12M,VMU(15),  RHOP  B05C  50
908           6(15),PHIKP(15),MP,TP,ZKP( 8),VMU3P,VMU4P,MTILP,CRHO(14),GMR(15)     B05C  51
909            COMMON/TEMCOM/SPDUM( 8),DER(40),DUMM1(15),SLOPE(15),REDUM(15)       B05C  52
910           1,SDUM1(40),SDUM2(40),FMDUM(40),XICON(40),FMCON(40),FMINIT( 1)      B05C  53
911           2,XIINIT( 1),DUDS( 40)                                              B05C  54
912            COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                     B05C  55
913            COMMON/MALCOM/FM(40, 1),TM(40, 1),HM(40, 1),SPM( 8,40, 1)          B05C  56
914           1,RHOVM(40, 1),FLUXJ( 3,40, 1),IMM,ITM,IFM,ISPM,IRHOVM,IFLUXJ       B05C  57
915            EQUIVALENCE(DELQM,DELQJM),(DQNL,DQJNL),(MALLQ,MALLQJ)              B05A0380
916            DIMENSIONCORAR(1)                                                  B05A0470
917            EQUIVALENCE(CORAR(1),AM(1))                                        B05A0480
918            EQUIVALENCE(AM,DQJRNL)                                             B05A0490
919       C    EVALUATES REDUCED SET OF DQNL AND DJNL. NOTE...DQNL FOLLOWED BY    B05A2390
920       C    DJNL IS EQUIVALENCED TO DQJNL FOR CONVENIENCE OF FOLLOWING LOOP.   B05A2400
921       C    ALSO, THE REDUCED SET DQJRNL IS EQUIV. TO AM(1) FOR STORAGE ECON.  B05A2410
922            DO 275 I=1,NRNL                                                    B05A2420
923            M = I + NAM                                                        B05A2430
924            L = LAR(M)                                                         B05A2440
925            DO 275 K=1,NSP                                                     B05A2450
926            DQJRNL(I,K) = DQJNL(L,K)                                           B05A2460
927            DO 275 J=1,NAM                                                     B05A2470
928            JJ = LAR(J)                                                        B05A2480
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      IF (I - 1) 275,270,275                                                    B05A2490
  270 DELQJW(K) = DELQJW(K) + DQJNL(JJ,K) * ENL(J)                              B05A2500
  275 DQJRNL(1,K) = DQJRNL(I,K) - DQJNL(JJ,K) * AP(J,M)                         B05A2510
      RHOVS = C1 * F(1,1) + HF(1,5)                                             B05A2520
      DO 278 K=1,NSP                                                            ENTR-MOD
  278 HALLQJ(K)=HALLQJ(K)+DELQJW(K)
      IF(KR(9)-2) 315,285,315                                                   ENTR-MOD
  285 DO 290 L=1,3                                                              B05A2550
  290 W(L) = FLUXJ(L,IS,IT)                                                     B05A2560
C     PREPARE DQJRNL AND HALLQJ FOR SURFACE MASS BALANCE                        B05A2570
  295 WSUM = W(1) + W(2) + W(3)                                                 B05A2580
      DO 310 K=2,NSP                                                            B05A2590
      DQJRNL(1,K) = DQJRNL(1,K) / C1                                            B05A2610
      HALLJ(K - 1) = HALLJ(K - 1) - DQJRNL(1,K) * RHOVS - DQJRNL(2,K) *         B05A2670
     1G(1,1)                                                                    B05A2680
      DO 310 KK=3,NRNL                                                          B05A2690
  310 HALLJ(K - 1) = HALLJ(K - 1) - DQJRNL(KK,K) * SP(1,1,KK - 2)               B05A2700
  315 IF (KR(16) - 1) 345,340,320                                               B05A2710
  320 IF (KR(17)) 340,340,335                                                   B05A2720
  325 FORMAT(52H  DEBUG DQJRNL(NRNL,NSP) BY ROWS, DELQW(5),HALLQJ(5)/           B05A2730
     1 (8X1P10E10.3))                                                           B05A2740
  330 FORMAT(35H  DEBUG DQJNL(NNLEQ,NSP) ROW BY ROW /(8X1P10E10.3))             B05A2750
  335 WRITE(KOUT,330)((DQJNL(I,K),K=1,NSP),I=1,NNLEQ)                           B05A2760
  340 WRITE(KOUT,325)((DQJRNL(I,K),K=1,NSP),I=1,NRNL),DELQW,DELJW,HALLQ,B05A2770
     1HALLJ                                                                     B05A2780
      IX = - 2                                                                  B05A2790
  345 CONTINUE                                                                  B05A2800
      IF(KIP) 346,346,375
  346 IF(KR(9)-2) 347,355,395
  347 DRNL(1)=FW(IS,IT)-F(1,1)
      DRNL(2)=0.
      IF(NSPM1) 350,350,348
  348 DO 349 K=1,NSPM1
      DRNL(K+2)=SPW(K,IS,IT)-SP(1,1,K)
  349 DRNL(2)=DRNL(2)+DRNL(K+2)*DTKW(K)
  350 IF(KR(11)) 351,351,352
  351 DRNL(2)=(TW(IS,IT)-T(1)-DRNL(2))/DTHW
      GO TO 595
  352 DRNL(2)=HW(IS,IT)-G(1,1)
      GO TO 595
  355 IF (KR(11) - 1) 375,365,360                                               B05A2830
  360 IF (KR(11) - 3) 370,375,370                                               B05A2840
  365 KQ(1) = 2                                                                 B05A2850
      DRNL(2)=HW(IS,IT)-G(1,1)
      HIP=(G(1,1)+EASE*(HW(IS,IT)-G(1,1)))/1.8
      GO TO 380
  370 KQ(1)=1
      IF(T(1)-1800.) 374,374,372
  372 IF(EASE-.85) 380,374,380                                                  ENTR-MOD
  374 TW(IS,IT)=AMAX1(T(1),1500.)
  375 T(1)=T(1)+EASE*(TW(IS,IT)-T(1))
      KIP=MAX0(KIP-1,0)
  376 KQ(1)=0
  380 KQ(6) = 2                                                                 B05A2910
      KQ(4) = 6                                                                 B05A2920
      IF (KR(7))385,385,390
  385 CALL EQUIL(KQ,0.,PE(IS,IT))                                               B05A2930
  390 KQ(6) = 0                                                                 B05A2940
```

```
      FW(IS,IT) = (RHOVW(IS,IT) - HF(1,5)) / C1                          B05A2950
      IF(KR(11)-1) 391,392,391
  391 DRNL(2)=(HW(IS,IT)-G(1,1))/EASE
  392 DRNL(1)=FW(IS,IT)-F(1,1)
      IF(NSPM1) 595,595,393
  393 DO 394 K=1,NSPM1
  394 DRNL(K+2)=(SPW(K,IS,IT)-SP(1,1,K))/EASE
      GO TO 595
C     KIP=1 IF USING ASSIGNED TEMPERATURE ON ENERGY BALANCE FOR TEFLON    B05A2970
  395 KIP = 0                                                            B05A2980
      W(3)=RHOVS-W(2)
      K9R=KR(9)-2                                                        ENTR-MOD
      GO TO (450,460,490,400),K9R                                        ENTR-MOD
  400 HMAT = HTEF
      EMIS = EMIST
      IF (ITS - 1) 465,465,405                                           B05A3070
  405 IF (TFZ) 465,465,410                                               B05A3080
  410 IF (ABS(T(1) - TFZ) - 10.) 465,435,435                             B05A3090
  415 IF (DTEMP * DUM2) 440,440,420                                      B05A3100
  420 IF (DUM1 * 20. + WDOT) 425,425,430                                 B05A3110
  425 TFZ = T(1) - 50. / DTEMP * ATEMP                                   B05A3120
      BUMP = 1.                                                          B05A3130
      GOTO 435                                                           B05A3140
  430 TFZ = T(1)
  435 TW(IS,IT) = TFZ                                                    B05A3160
      GOTO 445                                                           B05A3170
  440 TW(IS,IT) = T(1) + 50. / DTEMP * ATEMP                             B05A3180
      BUMP = 1.                                                          B05A3190
  445 KIP = 1                                                            B05A3200
      GO TO 490                                                          ENTR-MOD
  450 DRNL(1) = TW(IS,IT) - T(1)                                         ENTR-MOD
      AM(1,4) = 0.                                                       ENTR-MOD
      AM(2,5) = DTHW                                                     ENTR-MOD
      DO 455 K=1,NSPM1                                                   ENTR-MOD
  455 AM(1,K + 5) = DTKW(K)                                              ENTR-MOD
  460 HMAT=HCARB
      EMIS=EMISC
  465 TFZ = 0.
      DUM1 = STEF * EMIS * (T(1)) * * 3. * C3                            B05A3330
      DRNL(2) = - WALLQ + RHOVS * (HMAT - G(1,1)) - DUM1 * T(1) + RADS(
     1IS)*C3+W(2)*(HPG-HMAT)
      DUM2 = DRNL(2)                                                     B05A3360
      AM(2,4) = DQJRNL(1,1) + C1 * (G(1,1) - HMAT)
      DUM1 = DUM1 * 4.                                                   B05A3380
      AM(2,5) = DQJRNL(2,1) + DUM1 * DTHW + RHOVS                        B05A3390
      DO 470 K=1,NSPM1                                                   B05A3400
  470 AM(2,K + 5) = DQJRNL(K + 2,1) + DUM1 * DTKW(K)                     B05A3410
      IF(KR(9)-4) 510,475,495                                            ENTR-MOD
  475 DRNL(1)= VLNKW
      DO 472 K=1,IZ                                                      ENTR-MOD
      J=-IR(K)
      FNU(J)=VNU(ISU,J)
      IF (LEF(K)+LEFW(K)) 471,471,472
  471 FNU(J)=0.
  472 CONTINUE
      DO 476 K=1,IZ                                                      ENTR-MOD
  476 DRNL(1)=DRNL(1)+YW(K)*FNU(K)
      AM(1,4) = 0.                                                       B05A3440
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1045            DUM1 = TCW / T(1)                                                B05A3450
1046            AM(1,5) = DUM1 * DTHW
1047            DO 477 K=1,IZ                                                    ENTR-MOD
1048          477 AM(1,5)=AM(1,5)-DLPH(K)*FNU(K)
1049            DO 480 K=1,NSPM1                                                 B05A3470
1050            AM(1,K+5) = DUM1*DTKW(K)
1051            DO 480 KK=1,IZ                                                   ENTR-MOD
1052          480 AM(1,K+5)=AM(1,K+5)-DLPK(K,KK)*FNU(KK)                         ENTR-MOD
1053            GOTO 510                                                         B05A3490
1054          490 WDOT = C3 * EXP( (ADUM * TW(IS,IT) + BDUM) * TW(IS,IT) + CDUM) B05A3510
1055            KIP=KIP+1
1056            W(3) = WDOT                                                      B05A3540
1057            W(2) = 0.                                                        B05A3550
1058            W(1) = 0.                                                        B05A3560
1059            GOTO 295                                                         B05A3570
1060          495 WDOT = C3 * EXP( (ADUM * T(1) + BDUM) * T(1) + CDUM)           B05A3580
1061            AM(1,5) = WDOT * (ADUM * 2. * T(1) + BDUM)                       B05A3590
1062          500 DRNL(1) = RHOVS - WDOT                                         B05A3600
1063            DUM1 = ABS(DRNL(1))                                              B05A3610
1064            AM(1,4) = - C1                                                   B05A3620
1065            DO 505 K=1,NSPM1                                                 B05A3630
1066          505 AM(1,K + 5) = AM(1,5) * DTKW(K)                                B05A3640
1067            AM(1,5) = AM(1,5) * DTHW                                         B05A3650
1068          510 DO 520 K=1,NSPM1                                               B05A3660
1069            DRNL(K+2)=-WALLJ(K)-RHOVS*(SP(1,1,K)-TQ(K,L3)*HTM(K))+W(2)*HTM(K)*
1070           1 (TQ(K,L2)-TQ(K,L3))
1071            DO 515 KK=1,NRNL                                                 B05A3680
1072          515 AM(K + 2,KK + 3) = DQJRNL(KK,K + 1)                            B05A3690
1073            AM(K+2,4)=AM(K+2,4)+C1*(SP(1,1,K)-TQ(K,L3)*HTM(K))
1074          520 AM(K + 2,K + 5) = AM(K + 2,K + 5) + RHOVS                      B05A3710
1075            II = 0                                                           B05A3720
1076            IF(KR(9)-3) 525,540,525                                          ENTR-MOD
1077          525 IF(W(3)) 540,530,530
1078          530 DRNL(1)=(WDOT-W(3))/C1
1079            W(3)=WDOT
1080            DO 535 K=2,NRNL                                                  B05A3760
1081          535 DRNL(K) = DRNL(K) - DRNL(1) * AM(K,4)                          B05A3770
1082            II = 1                                                           B05A3780
1083          540 IXX = IX                                                       B05A3790
1084            CALL RERAY(NRNL-II,AM(II+1,II+4),0,DRNL(II+1),1,0,IXX,153)       B05C3800
1085            IF (KR(9) + KIP - 6) 560,545,560                                 B05A3820
1086          545 DTEMP = DRNL(2) * DTHW                                         B05A3830
1087            DO 550 K=1,NSPM1                                                 B05A3840
1088          550 DTEMP = DTEMP + DTKW(K) * DRNL(K + 2)                          B05A3850
1089            ATEMP = ABS(DTEMP)                                               B05A3860
1090            IF (ATEMP - 50.) 555,560,415                                     B05A3870
1091          555 TFZ = - T(1)                                                   B05A3880
1092          560 CONTINUE                                                       B05A3890
1093            WDOT=W(3)
1094          595 RETURN
1095            END                                                              B05A3360
1096      C806A                                                                  B06A 001
1097            SUBROUTINE LINCER                                                B06A 002
1098            COMMON/EDGCOM/              PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,B06A   3
1099           1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMNE,CGE,C90 ENTR-MOD
1100           2,DSIP(40),IDSIP,TTVC,TVCC(40),HEA(40),SF(20),CS(20),CSPR(20),     ENTR-MOD
1101           3CG(20),CGP(20),SREF,GEP,NEN                                      ENTR-MOD
1102            COMMON/ERRCOM/FLE( 43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEM    B06A   6
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1103          1,SPLEM( 8),ELM(14),ELMM,IFLP,IGLM,ISPLM( 8),NELM,ILMM,OFL(43)      806A   7
1104          2,DGL(30),DSPL(30, 8),FNLE(15),GNLE(15),SPNLE(15, 8),ENL(153)       806A   8
1105          3,FNLEM,GNLEM,SPNLEM( 8),          ENLMM,IFNLM,IGNLM,ISPNLM( 8)     806A   9
1106          4,NENLM,INLMM,DFNL(15),DGNL(15),DSPNL(15, 8),DRNL(15)               806A  10
1107           COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)       806A  11
1108          1,LAR(153),BA1(43,18),BA2(30,15)                                    806A  12
1109           COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,META,I,IS,M806A  13
1110          1S,IT,ITIME,NSP,NSPM1,MAN,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) 806A  14
1111          2,B(8),      MME,MON,KQ(10),ITEM,MITEM,KR17,MBT,MBT2,IDENT,KR9(40)  806A  15
1112          3,KAUXO,JTIME,JSPEC,MD(3)                                           806A  16
1113           COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROXAP(40)  806A  17
1114          1,RMOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO,   806A  18
1115          2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                             806A  19
1116           COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                      806A  20
1117      C    EVALUATE LINEAR ERRORS FOR MOMENTUM AND ENERGY                      806A 018
1118           NELM=NSP+1                                                          806A 019
1119           NENLM=NELM                                                          806A 020
1120           NUL=0
1121           DO 400 I=1,MAT1I                                                    ENTR-MOD
1122       400 BA1(I,1)=9.                                                         ENTR-MOD
1123           DO 401 I=2,META
1124           IF(I-2) 4004,4003,4004
1125      4003 IF(KR(10)) 4000,4000,4001
1126      4004 IF(I-META) 4002,4005,4002
1127      4005 IF(KR(10)-1) 4002,4000,4002
1128      4000 DUM1=B(4)
1129           DUM2=B(5)
1130           DUM3=B(2)
1131           DUM4=B(3)
1132           DUM5=B(1)
1133           DUM6=1.0
1134           GO TO 4002
1135      4001 DUM1=B(3)
1136           DUM2=0.
1137           DUM3=B(1)
1138           DUM4=0.
1139           DUM5=1.0
1140           DUM6=0.
1141      4002 CONTINUE
1142           FLE(I-1)=-(F(1,I-1)+DETA(I-1)*F(2,I-1)+DSQ(I-1)/2.*F(3,I-1)+DCU(
1143          1I-1)*(DUM1*F(4,I-1)+DUM2*F(4,I))-F(1,I))
1144           M=I+NETA-2
1145           FLE(M)=-(F(2,I-1)+DETA(I-1)*F(3,I-1)+DSQ(I-1)*(DUM3*F(4,I-1)+DUM4*
1146          1F(4,I))-F(2,I))
1147           M=M+1
1148           DO 403 K=NUL,NSPM1
1149           SPLE(I,K)=-(SP(1,I-1,K)+DETA(I-1)*SP(2,I-1,K)+DSQ(I-1)*(DUM3*SP(3,
1150          1           I-1,K)+DUM4*SP(3,I,K))-SP(1,I,K))
1151       403 SPLE(M,K)=-(SP(2,I-1,K)+DETA(I-1)*DUM5*(SP(3,I-1,K)+DUM6*SP(3,I,K)
1152          1           )-SP(2,I,K))
1153           M=I+2*NETA-3
1154       401 FLE(M)=-(F(3,I-1)+DETA(I-1)*DUM5*(F(4,I-1)+DUM6*F(4,I))-F(3,I))
1155           FLE(MAT1I)=-DUM6*(F(3,NETA)-ALPH*ALPH*DUEDGE)                       ENTR-MOD
1156           BA1(MAT1I,1)=-2.*DUM6*DUEDGE*ALPH                                   ENTR-MOD
1157           IF(ABS(BA1(MAT1I,1)).GT.0.) CALL MATS1(BA1)                         ENTR-MOD
1158           GLE(1)=-(G(1,NETA)-CGE)                                             ENTR-MOD
1159           GLE(MAT2I)=-DUM6*(G(2,NETA)-ALPH*GEP)                               ENTR-MOD
1160           IF(NSPM1)404,404,405
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      405 DO 402 K=1,NSPM1                                                          B06A 044
          SPLE(1,K)=-(SP(1,NETA,K)-SPE(K,IS,IT))                                    B06A 045
          SPLE(MAT2I,K)=-SP(2,NETA,K) * DUM6                                        B06A 046
C         DETERMINE MAXIMUM LINEAR ERRORS                                           B06A 046
      402 CALL ABMAX(MAT2I,SPLE(1,K),SPLEM(K),ISPLM(K))                             B06A 047
      404 CALL ABMAX(MAT1I,FLE,FLEM,IFLM)                                           B06A 048
          CALL ABMAX(MAT2I,GLE,GLEM,IGLM)                                           B06A 049
          ELM(1)=FLEM                                                               B06A 051
          ELM(2)=GLEM*.001                                                          B06A 052
          IF(NSPM1)406,406,407                                                      B06A 053
      407 DO 406 K=3,NELM                                                           B06A 054
      406 ELM(K)=SPLEM(K-2)*.1                                                      B06A 055
      406 CALL ABMAX(NELM,ELM,ELMM,ILMM)                                            B06A 056
C         FORM PRODUCT OF A**-1 AND LINEAR ERRORS                                   B06A 057
      469 CALL MATS1(FLE)                                                           B06A 058
          DO 474 K=NUL,NSPM1                                                        B06A 061
      474 CALL MATS2(SPLE(1,K))                                                     B06A 062
          RETURN                                                                    B06A 065
          END                                                                       B06A 065
C     B07A                                                                        B07A 001
          SUBROUTINE REFCON                                                       B07A 002
          COMMON/EDGCOM/          PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,B07A   3
         1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMWE,CGE,C90  ENTR-MOD
         2,DSIP(40),IDSIP,TTVC,TVCC(40),MEA(40),SF(20),CS(20),CSPR(20),      ENTR-MOD
         3CG(20),CGP(20),SREF,GEP,MEN,UINF,RHOINF,HINF,PINF                  ENTR-MOD
          COMMON/MISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, B007A   6
         1 ),XI(40),MF(15,5),MG(15,3),MSP(15,3, 8),MALPH,MUE,MMUE,MFN,DLX2  B07A   7
         2,C3M(40),BETAM(40)                                                 B07A   8
          COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,META,I,IS,NB07A   9
         1S,IT,NTIME,MSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CA*E(15) B07A  10
         2,B(8),      MWE,MON,KQ(10),ITEN,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B07A  11
         3,KAUXO,JTIME,JSPEC,MD(3)                                           B07A  12
          COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) B07A  13
         1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO,  B07A  14
         2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                             B07A  15
          COMMON/TEMCOM/SPDUM( 8),DER(40),DUMM1(15),SLOPE(15),REDUM(15)      B07A  16
         1,SDUM1(40),SDUM2(40),FMDUM(40),XICON(40),FMCON(40),FMINIT( 1)      B07A  17
         2,XIINIT( 1),DUDS( 40)                                              B07A  18
          COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                     B07A  19
          COMMON/MALCOM/FM(40, 1),TM(40, 1),HM(40, 1),SPM( 8,40, 1)          B07A  20
         1,RMOVM(40, 1),FLUXJ( 3,40, 1),IMM,ITM,IFM,ISPM,IRMOVM,IFLUXJ       B07A  21
          DATA IHR,IHD,IHI,IHF/1HR,1HC,1HI,1HF/                              ENTR-MOD
     7007 FORMAT(8E10.4)                                                     B07A 024
     7008 FORMAT(A1,E9.4,7E10.4/(8E10.4))                                    ENTR-MOD
     9901 FORMAT(I3,7E10.3)                                                  B07A 92*
      106 FORMAT(I2,E8.3,7E10.5)                                             ENTR-MOD
       15 FORMAT(1H1)
       16 FORMAT (/,1X,23HDISTANCE,FT             ,8E12.5/(24X,8E12.5))    B07A 027
       17 FORMAT (/,1X,23HPRESSURE RATIO          ,8E12.5/(24X,8E12.5))    B07A 028
       18 FORMAT (/,1X,23HENTROPY DROP,BTU/LB R   ,8E12.5/(24X,8E12.5))    B07A 029
       19 FORMAT (/,1X,23HWALL ENTHALPY,BTU/LB    ,8E12.5/(24X,8E12.5))    B07A 030
       20 FORMAT (/,1X,23HWALL TEMPERATURE,DEG R  ,8E12.5/(24X,8E12.5))    B07A 031
       21 FORMAT (/,1X,23HWALL STREAM FUNCTION    ,8E12.5/(24X,8E12.5))    B07A 032
       22 FORMAT (/,1X,23HMASS FLUX,LB/SEC FT**2  ,8E12.5/(24X,8E12.5))    B07A 033
       23 FORMAT (/,1X,23HELEMENTAL MASS FRACTION,8E12.5/(24X,8E12.5))     B07A 034
       24 FORMAT (/,1X,23HCOMP FLUX,LB/SEC FT**2  ,8E12.5/(24X,8E12.5))    B07A 035
       25 FORMAT (/,1X,23HSTATIC PRESSURE,ATM     ,8E12.5/(24X,8E12.5))    B07A 036
       26 FORMAT (/,1X,23HXI,(LB/SEC)**2          ,8E12.5/(24X,8E12.5))    B07A 037
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1219        27 FORMAT (/,1X,23HBETA                        ,6E12.5/(24X,6E12.5))      B07A 038
1220        28 FORMAT (/,1X,23HROKAP                       ,6E12.5/(24X,6E12.5))      B07A 039
1221        29 FORMAT (/,1X,23HEDGE VELOCITY,FT/SEC        ,6E12.5/(24X,6E12.5))      B07A 040
1222        30 FORMAT (/,1X,23HNORMALIZED MASS FLUX        ,6E12.5/(24X,6E12.5))      B07A 041
1223        31 FORMAT (/,1X,23HNORMALIZED COMP FLUX        ,6E12.5/(24X,6E12.5))      B07A 042
1224        32 FORMAT (/,1X,23HINCIDENT RADIATION FLUX,6E12.5/(24X,6E12.5))
1225        33 FORMAT(/,1X,23H-1/FLUX NORM.PARAMETER ,6E12.5/(24X,6E12.5))            B07A 044
1226        34 FORMAT(//1X,23HSTREAM FUNCTION,LB/SEC ,6E12.5/(24X6E12.5))             ENTR-MOD
1227        35 FORMAT(/,1X,23HENTROPY CHANGE,BTU/LB R,6E12.5/(24X,6E12.5))            ENTR-MOD
1228        36 FORMAT(/,1X,23HENTHALPY CHANGE,BTU/LB ,6E12.5/(24X,6E12.5))            ENTR-MOD
1229        37 FORMAT(/24H SHOCK ANGLE,DEGREES    6E12.5/(24X6E12.5))                 ENTR-MOD
1230        38 FORMAT(/24H SHOCK ANGLE,RADIANS    6E12.5/(24X6E12.5))                 ENTR-MOD
1231      1532 IF (ITEM-1) 1539,1538,1539                                             B07A 051
1232      1538 IOSIP=1                                                                B07A 052
1233           IPRE=1                                                                 B07A 053
1234           IRAD=1
1235           NEN=0                                                                  ENTR-MOD
1236           DO 1540 I=1,NS                                                         B07A 054
1237      1540 OSIP(I)=0.                                                             B07A 055
1238      1539 IF (IOSIP-ITEM) 1536,1537,1536                                         ENTR-MOD
1239      1537 IF(KR(5)-5) 1522,1535,1536                                             ENTR-MOD
1240      1522 IF(KR(5)-2) 1536,1524,1524                                             ENTR-MOD
1241      1524 READ(KIN, 106) NEN,UINF,RHOINF,HINF,PINF                               ENTR-MOD
1242           HINF=HINF/1.8                                                          ENTR-MOD
1243           IF(NEN) 1527,1527,1526                                                 ENTR-MOD
1244      1526 READ(KIN,7008) IRED,(SF(I),I=1,NEN)                                    ENTR-MOD
1245           IF(IRED.NE.IMI.AND.IRED.NE.IHF) GO TO 1530                             ENTR-MOD
1246           DO 1547 I=1,NEN                                                        ENTR-MOD
1247           IF(IRED.EQ.IMI) SF(I)=SF(I)/12.                                        ENTR-MOD
1248           DUM=RHOINF*UINF*SF(I)                                                  ENTR-MOD
1249           IF(ABS(KR(6)-2).EQ.1)GO TO 1547                                        ENTR-MOD
1250           DUM=DUM/2.*SF(I)                                                       ENTR-MOD
1251      1547 SF(I)=DUM                                                              ENTR-MOD
1252           GO TO 1538                                                             ENTR-MOD
1253      1527 NEN=NS                                                                 ENTR-MOD
1254           DO 1528 I=1,NS                                                         ENTR-MOD
1255      1528 SF(I)=RHOINF*UINF/2.*ROKAP(I)**2                                       ENTR-MOD
1256      1538 READ(KIN,7008)IRED,(CS(I),I=1,NEN)                                     ENTR-MOD
1257           WRITE(KOUT,34)(SF(I),I=1,NEN)                                          ENTR-MOD
1258           IF(IRED.NE.IMD) GO TO 1548                                             ENTR-MOD
1259           WRITE (KOUT,37)(CS(I),I=1,NEN)                                         ENTR-MOD
1260           DO 1551 I=1,NEN                                                        ENTR-MOD
1261      1551 CS(I)=CS(I)/57.29577                                                   ENTR-MOD
1262           IRED=IHR                                                               ENTR-MOD
1263           GO TO 1549                                                             ENTR-MOD
1264      1548 IF(IRED.NE.IHR) GO TO 1550                                             ENTR-MOD
1265           WRITE(KOUT,38)(CS(I),I=1,NEN)                                          ENTR-MOD
1266           GO TO 1549                                                             ENTR-MOD
1267      1550 WRITE(KOUT,35) (CS(I),I=1,NEN)                                         ENTR-MOD
1268      1549 IF(KR(5)-4) 1529,1525,1529                                             ENTR-MOD
1269      1525 READ (KIN,7007) (CG(I),I=1,NEN)                                        ENTR-MOD
1270           CALL SLOPC (NEN,SF,CG,CGP,DER)                                         ENTR-MOD
1271           WRITE(KOUT,36)(CG(I),I=1,NEN)                                          ENTR-MOD
1272           GO TO 1529                                                             ENTR-MOD
1273      1535 READ (KIN,7007) (OSIP(I),I=1,NS)                                       B07A 058
1274      1529 READ (KIN,106) IOSIP                                                   ENTR-MOD
1275      1536 IF (IPRE-ITEM) 1534,1533,1534                                          B07A 060
1276      1533 READ (KIN,7007) (PRE(I),I=1,NS)                                        B07A 061
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1277          READ (KIN,106) IPRE
1278       1534 IF(PRE(1)) 1541,1542,1541                                    B07A 062
1279       1542 DO 1543 I=2,NS
1280          IF(PRE(I)) 1544,1543,1544
1281       1544 L=I
1282          GO TO 1545
1283       1543 CONTINUE
1284       1545 RNOSE=S(L)/SQRT(1.-PRE(L))
1285          DO 1546 I=2,L
1286       1546 PRE(I-1)=1.-S(I-1)/RNOSE*S(I-1)/RNOSE
1287       1541 DO 1531 I=1,NS
1288          PTE(I ,1)=PTET(ITEM)
1289       1531 PE(I ,1)=PTE(I ,1)*PRE(I )                                   B07A 064
1290          IF (IRAD-ITEM)1554,1552,1554                                   B07A 065
1291       1552 READ (KIN,7007) (RADR(I),I=1,NS)
1292          READ (KIN,106) IRAD
1293       1554 DO 1553 I=1,NS
1294       1553 RADS(I)=RADFL(ITEM)*RADR(I)
1295        105 DO 104 IS=1,NS
1296        201 IF (IS-1) 207,207,203                                        B07A 066
1297        207 KQ(1)=2                                                      B07A 068
1298          KQ(5)=2                                                        B07A 070
1299          KQ(6)=0                                                        B07A 071
1300          KQ(4)=0                                                        B07A 072
1301          IF (KR(7))8003,8003,8002                                       B07A 073
1302       8002 CALL STATE                                                   B07A
1303          WRITE(KOUT,992)
1304          WRITE(KOUT,994)
1305        992 FORMAT(1H1,10X20HISENTROPIC EXPANSION /12X15HEDGE CONDITIONS //)
1306        994 FORMAT(5X11HSTREAMWISE      TEMP          CP          STATIC      DENS
1307           1ITY    VISCOSITY    VELOCITY    ENTHALPY    ENTROPY     MACH NO. /
1308           25X45HDIMENSION                  FROZEN      PRESSURE /7X10HM(FEET)
1309           3    (DEG R)     (BTU/         (ATM)      (LB/CU FT)  (LB/SEC FT)  (FT
1310           4/SEC     (BTU/LB)     (BTU/  /30X10HLB DEG R) 62X10HLB DEG R)  /)
1311           GO TO 8004
1312       8003 CALL EQUIL(KQ,GE(ITEM),PTE(1,IT))                            B07A
1313       8004 KQ(1)=3                                                      B07A
1314          KQ(2)=0                                                        B07A
1315          KQ(3)=6                                                        B07A 076
1316          KQ(5)=1                                                        B07A 077
1317          IF(KR(6)-2) 210,203,203                                        B07A 078
1318        203 IF (KR(7))8006,8006,8005
1319       8005 CALL STATE                                                   B07A
1320          GO TO 210
1321       8006 CALL EQUIL(KQ,0.,PE(IS,IT))
1322        210 IF (NSPM1)205,205,215                                        B07A
1323        215 DO 216 K=1,NSPM1
1324        216 SPE(K,IS,IT)=SP(1,NETA,K)                                    B07A 084
1325        205 IF(KR(15)) 9903,9904,9903                                    B07A 085
1326       9903 WRITE(KOUT,9901) IS,MEA(IS),UE(IS),PTE(IS,1),TE(IS),RHOE(IS)  B07A 096
1327          1 ,VVUE(IS)                                                    ENTR-MOD
1328       9904 CONTINUE                                                     ENTR-MOD
1329        104 CONTINUE                                                     B07A 099
1330          IF(IRED.NE.IHR)GO TO 103                                       B07A 100
1331          KQ(1)=2                                                        ENTR-MOD
1332          KQ(5)=3                                                        ENTR-MOD
1333          DO 102I=1,NEN                                                  ENTR-MOD
1334          CALL EQUIL(KQ,CS(I),PTE(1,1))                                  ENTR-MOD
                                                                             ENTR-MOD
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1335          IF(I.EQ.1) CS1=CS(1)                                          ENTR-MOD
1336        102 CS(I)=CS(I)-CS1                                             ENTR-MOD
1337        103 IF(NEN.GT.0)CALL SLOPQ(NEN,SF,CS,CSPR,DER)                  ENTR-MOD
1338      C     END OF EDGE PROPERTY LOOP, START OF BETA AND XI CALCULATION  ENTR-MOD
1339        605 XI(1)=0.                                                    B07A 105
1340            J=NDISC+1                                                   B07A 106
1341            DO 111 II=1,J                                               B07A 107
1342            K=NSD(II)                                                   B07A 108
1343            M=MSD(II)                                                   B07A 109
1344            MM=M+1
1345            LL=K+M-1                                                    B07A 110
1346            IF (II-1) 6052,6052, 402                                    B07A 111
1347       6052 IF (KR(6)-1) 400,401,402                                    B07A 112
1348      C     AXISYMETRIC BLUNT                                           B07A 113
1349        400 DO 403 I=M,LL                                               B07A 114
1350            SDUM2(I)=S(I)*S(I)                                          B07A 115
1351            IF(S(I)) 403,403,4031                                       B07A 116
1352       4031 DUM1=ROKAP(I)/S(I)                                          B07A 117
1353            XICON(I)=UE(I)/S(I)*RHOE(I)/4.*VMUE(I)*DUM1*DUM1            B07A 118
1354        403 SDUM1(I)=SDUM2(I)*SDUM2(I)                                  B07A 119
1355            QI=4.                                                       B07A 120
1356            BETAM(1)=0.5                                                B07A 121
1357            GO TO 406                                                   B07A 122
1358      C     PLANAR BLUNT                                                B07A 123
1359        401 DO 404 I=M,LL                                               B07A 124
1360            SDUM2(I)=S(I)                                               B07A 125
1361            IF(S(I)) 404,404,4041                                       B07A 126
1362       4041 XICON(I)=UE(I)/S(I)*RHOE(I)/2.*VMUE(I)                      B07A 127
1363        404 SDUM1(I)=S(I)*S(I)                                          B07A 128
1364            QI=2.                                                       B07A 129
1365            BETAM(1)=1.                                                 B07A 130
1366            GO TO 406                                                   B07A 131
1367        402 IF (KR(6)-2) 408,407,408                                    B07A 132
1368      C     AXISYMETRIC SHARP                                           B07A 133
1369        407 DO 409 I=M,LL                                               B07A 134
1370            SDUM2(I)=S(I)*S(I)                                          B07A 135
1371            DUM1=ROKAP(I)/S(I)                                          B07A 136
1372            XICON(I)=RHOE(I)*UE(I)*VMUE(I)*DUM1/3.*DUM1                 B07A 137
1373        409 SDUM1(I)=S(I)*SDUM2(I)                                      B07A 138
1374            XI(1)      =XICON(1)*S(1)*S(1)*S(1)                         B07A 139
1375            QI=3.                                                       B07A 140
1376            IF (II-1) 4051,4051,406
1377      C     PLANAR SHARP                                                B07A 142
1378        408 DO 405 I=M,LL                                               B07A 143
1379            SDUM2(I)=S(I)                                               B07A 144
1380            XICON(I)=RHOE(I)*UE(I)*VMUE(I)*ROKAP(I)*ROKAP(I)            B07A 145
1381        405 SDUM1(I)=S(I)                                               B07A 146
1382            QI=1.                                                       B07A 147
1383            IF (II-1) 4052,4052,406
1384       4052 XI(1)      =XICON(1)*S(1)                                   B07A 149
1385       4051 MM=M
1386        406 CONTINUE                                                    B07A 152
1387            CALL SLOPQ(K,S(M),UE(M),DUDS(M),DER(M))                     B07A 153
1388            IF (KR(6)-2) 4066,4062,4062                                 B07A 154
1389       4066 IF (M-1) 4061,4061,4062                                     B07A 155
1390       4061 IF (RNOSE) 4063,4063,4064                                   B07A 156
1391      COMMENT...DUES COMPUTED BY SLOPQ                                  B07A 157
1392       4063 DUES=DUDS(1)                                                B07A 158
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      GO TO 4065                                                        B07A 159
COMMENT...DUES FROM EFFECTIVE NOSE RADIUS USING NEWTONIAN FLOW          B07A 160
 4064 DUES=SQRT(2./RHOE(1)*PE(1,IT)*32.1740*2116.)/RNOSE                B07A 161
 4065 XICON( 1)=RHOE( 1)*VMUE( 1)/(2.*VKAP+2.)*DUES                    B07A 162
 4062 CALL SLOPQ(K,SDUM1(M),XICON(M),DER(M),XI(M))                      B07A 163
      IF (LL-MM) 111,4101,4101                                          B07A 165
 4101 DO 410 L=MM,LL                                                    B07A 166
  410 BETAM(L)=2./QI*XI(L)/UE(L)*S(L)/SDUM1(L)*DUDS(L)/XICON(L)         B07A 167
  111 CONTINUE                                                          B07A 168
 9803 FORMAT(8E10.4)                                                    B07A 172
      WRITE(KOUT,15)
      WRITE(KOUT,16)(    S(I),I=1,NS)
      WRITE(KOUT,28)(ROKAP(I),I=1,NS)
      WRITE(KOUT,26)(   XI(I),I=1,NS)
      WRITE(KOUT,17)(  PRE(I),I=1,NS)
      WRITE(KOUT,25)( PE(I,1),I=1,NS)
      WRITE(KOUT,29)(   UE(I),I=1,NS)
      WRITE(KOUT,27)(BETAM(I),I=1,NS)
      WRITE(KOUT,32)( RADS(I),I=1,NS)
      WRITE(KOUT,18)( DSIP(I),I=1,NS)
C     CALCULATION OF C3 MATRIX                                          B07A 173
      DO 138 I=1,NS                                                     B07A 174
      IF (KR(6)-1) 137,137,158                                          B07A 175
  137 IF (I-1) 139,139,158                                              B07A 176
  139 C3M(I)=-SQRT (BETAM(I)/(DUES*RHOE( I)*VMUE( I)))                  B07A 177
      GO TO 138                                                         B07A 178
  158 C3M(I)=-SQRT(2.*XI( I))/(RHOE( I)*ROKAP( I)*UE( I)*VMUE( I))      B07A 179
  138 CONTINUE                                                          B07A 180
      WRITE (KOUT,33)(C3M(I),I=1,NS)
C     READ WALL CONDITIONS IF UNCOUPLED                                 B07A 189
      JRHOVW=0
      IF (ITEM-1) 108,108,7004
  108 IHW=1                                                             B07A 191
      ITW=1                                                             B07A 192
      IFW=1                                                             B07A 193
      IRHOVW=1                                                          B07A 194
      ISPW=1                                                            B07A 195
      IFLUXJ=1                                                          B07A 196
      DO 49 I=1,NS
      DO 49 L=1,3
   49 FLUXJ(L,I,1) = 0.
  107 IF (KR(9)-3) 7054,7005,1071
 1071 IF(KR(9)-5) 7047,7005,7047
 7054 IF(KR(11)-2) 7062,7040,7047                                       B07A 198
 7062 IF(KR(11)) 7004,7005,7004                                         B07A 199
 7004 IF (IHW-ITEM) 1091,109,1091                                       B07A 200
 1091 IF(   IHW-1) 1201,7005,1201
  109 READ(KIN,7007)((HW(J,JJ),JJ=1,NTIME),J=1,NS)                      B07A 201
      READ (KIN,106) IHW                                                B07A 202
 1201 WRITE (KOUT,19)(HW(I,1),I=1,NS)
      IF (ITEM-1) 7038,7038,7060
 7005 IF (ITW-ITEM)1092,110,1092                                        B07A 205
 1092 IF(   ITW-1) 1202,7060,1202
  110 READ(KIN,7007)((TW(J,JJ),JJ=1,NTIME),J=1,NS)                      B07A 206
      READ (KIN,106) ITW                                                B07A 207
 1202 WRITE (KOUT,20)(TW(I,1),I=1,NS)
      IF (ITEM-1) 117,117,7060
  117 IF (KR(9)-3) 7038,7047,7047                                       B07A 209
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1451      7038 IF(KR(9)-1) 7060,7061,7040                                    B07A 210
1452      7060 IF (IFW-ITEM) 1093,112,1093                                   B07A 211
1453      1093 IF(   IFW-1) 1203,7061,1203
1454       112 READ(KIN,7007)((FW(J,JJ),JJ=1,NTIME),J=1,NS)                  B07A 212
1455           READ (KIN,106) IFW                                            B07A 213
1456      1203 WRITE (KOUT,21)(FW(I,1),I=1,NS)
1457           GO TO 7006                                                    B07A 215
1458      7061 IF (IRHOVW-ITEM) 1094,118,1094                                B07A 216
1459      1094 IF(IRHOVW-1) 1204,7006,1204
1460       118 READ(KIN,7007)((RHOVW(J,JJ),JJ=1,NTIME),J=1,NS)               B07A 217
1461           READ (KIN,106) IRHOVW                                         B07A 218
1462           JRHOVW=1
1463      1204 IF(KR(8)-JRHOVW) 1102,1101,1101
1464      1102 WRITE (KOUT,22)(RHOVW(I,1),I=1,NS)                           B07A 220
1465           GO TO 7006                                                    B07A 221
1466      1101 WRITE (KOUT,30)(RHOVW(I,1),I=1,NS)                           B07A 222
1467      7006 IF(NSPM1) 7043,7043,7015                                      B07A 223
1468      7015 IF (ISPW-ITEM) 1095,114,1095                                  B07A 224
1469      1095 IF(  ISPW-1) 1205,7040,1205
1470       114 DO 7014 K=1,NSPM1                                             B07A 225
1471      7014 READ(KIN,7007)((SPW(K,J,JJ),JJ=1,NTIME),J=1,NS)               B07A 226
1472           READ (KIN,106) ISPW                                           B07A 227
1473      1205 DO 1097 K=1,NSPM1
1474      1097 WRITE (KOUT,23)( SPW(K,I,1),I=1,NS)                          B07A 229
1475           GO TO 7043                                                    B07A 230
1476      7040 IF (IFLUXJ-ITEM)1096,115,1096                                 B07A 231
1477      1096 IF(IFLUXJ-1) 1206,7043,1206
1478       115 DO 7041 K=1,3                                                 B07A 232
1479      7041 READ(KIN,7007) ((FLUXJ(K,J,JJ),JJ=1,NTIME),J=1,NS)            B07A 233
1480           READ (KIN,106) IFLUXJ                                         B07A 234
1481           JRHOVW=1
1482      1206 DO 1098 K=1,3
1483           IF(KR(8)-JRHOVW) 1104,1103,1103
1484      1104 WRITE (KOUT,24)(FLUXJ(K,I,1),I=1,NS)                         B07A 237
1485           DO 7039 J=1,NS
1486      7039 FLUXJ(K,J,1)=FLUXJ(K,J,1) * C3M(J)
1487           GO TO 1098                                                    B07A 238
1488      1103 WRITE (KOUT,31)(FLUXJ(K,I,1),I=1,NS)                         B07A 239
1489      1098 CONTINUE                                                      B07A 240
1490           GO TO 7047
1491      7043 IF(JRHOVW) 7047,7047,7045
1492         C     CALCULATE FW IF RHOVW GIVEN                               B07A 253
1493      7045 J=NDISC+1                                                     B07A 254
1494           DO 7046 II=1,J                                                B07A 255
1495           K=NSD(II)                                                     B07A 256
1496           M=MSD(II)                                                     B07A 257
1497           LL=K+M-1                                                      B07A 258
1498           DO 209 I=M,LL                                                 B07A 259
1499           IF(I.EQ.M.AND.II.NE.1) GO TO 209                              ENTR-MOD
1500           IF (KR(8)) 7049,7049,2291                                     B07A 260
1501      7049 RHOVW(I,IT)=RHOVW(I,IT)*C3M(I)                                B07A 261
1502      2291 IF (II-1) 7048,7048, 230                                      B07A 262
1503      7048 IF (KR(6)) 229,229,230                                        B07A 263
1504         C     VALID AT AXISYMETRIC STAGNATION POINT ONLY                B07A 264
1505       229 FWCON(I)=-RHOVW(I,IT)/(2.*C3M(I))                            B07A 265
1506           IF( I-1) 209,209,232                                          B07A 266
1507         C     MODIFICATION FOR AXISYMETRIC BLUNT AWAY FROM STAGNATION POINT B07A 267
1508       232 FWCON( I)=FWCON( I)/S( I)*RCKAP( I)                          B07A 268
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1509            GO TO 209                                                       B07A 269
1510      C     VALID FOR ALL PLANAR                                            B07A 270
1511        230 FWCON(I)=-RHOVW(I,IT)/C3M(I)*ROKAP(I)                           ENTR-MOD
1512            IF(KR(6)-2) 209,236,209                                         B07A 272
1513      C     MODIFICATION FOR AXISYMETRIC SHARP                              B07A 273
1514        236 FWCON( I)=FWCON( I)/S( I)*ROKAP( I)/2.                          B07A 274
1515        209 FLUXJ(2,I,1)=RHOVW(I,1)
1516            FWDUM(1)=FWCON(1)*S(1)                                          B07A 276
1517            IF(KR(6)-2) 241,237,241                                         B07A 277
1518      C     MODIFICATION FOR AXISYMETRIC SHARP                              B07A 278
1519        237 FWDUM(1)=FWDUM(1)*S(1)                                          B07A 279
1520        241 CONTINUE                                                        B07A 280
1521       7046 CALL SLOPQ(K,SDUM2(M),FWCON(M),DER(M),FWDUM(M))                 B07A 281
1522            DO 126 I =1,NS                                                  B07A 282
1523            IF(I -1) 124,124,123                                            B07A 283
1524        124 IF (KR(6)-1) 133,133,123                                        B07A 284
1525        133 IF (S(I)) 113,113,123                                           B07A 285
1526        113 FW(1,IT)=RHOVW(1,IT)                                            B07A 286
1527            GO TO 126                                                       B07A 287
1528        123 FW(I ,IT)=FWDUM(I )/SQRT (2.*XI(I ))                            B07A 288
1529        126 CONTINUE                                                        B07A 289
1530       7047 RETURN                                                          B07A 290
1531            END                                                             B07A 291
1532      C808A                                                                 B08A 001
1533            SUBROUTINE ICOEFF                                               B08A 002
1534            COMMON/COECOM/              C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15B08B   3
1535           1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C2E,C27,C28,C29,C30,C31,CB08B   4
1536           232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48B08B   5
1537           3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,CB08B   6
1538           465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,C81B08B   7
1539           5,C82,C83,C84,C85,C86,C87,C88                                    B08B   8
1540            COMMON/COECON/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8)  B08B   9
1541           1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8)    B08B  10
1542           2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8) B08B  11
1543           3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XM(5),XG(5),XSP(5, 9)B08B  12
1544           4,CKK3( 8, 8)                                                    B08B  13
1545            COMMON/EDGCOM/              PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,B08B  14
1546           1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMWE,CGE,C90  ENTR-MOD
1547           2,DSIP(40),IDSIP,TTVC,TVCC(40),HEA(40),SF(20),CS(20),CSPR(20),     ENTR-MOD
1548           3CG(20),CGP(20),SREF,GEP,NEN                                     ENTR-MOD
1549            COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)    B08B  17
1550           1,LAR(153),BA1(43,18),BA2(30,15)                                 B08B  18
1551            COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8B08B  19
1552           1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HHUE,HFW,DLX2B08B  20
1553           2,C3M(40),BETAM(40)                                              B08B  21
1554            COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB08B  22
1555           1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B08B  23
1556           2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B08B  24
1557           3,KAUXO,JTIME,JSPEC,MD(3)                                        B08B  25
1558            COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15)  B08B  26
1559           1,CPBAR(15),VKW(15),PHIK(15, 8),DRHOH,DRHOK( 8),ZK( 8),DZKH( 8), D3B08B  27
1560           2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8)B08B  28
1561           3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)  B08B  29
1562           4,DPHIKK( 8, 8),      DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL  B08B  30
1563           5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15),  RHOP B08B  31
1564           6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15)  B08B  32
1565            COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                  B08B  33
1566      C     FIRST, EVAL DERIVATIVES OF STATE PROPERTIES WITH RESPECT TO ETA  B08A 028
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1567            VMU4P=DMU4H*HP                                                  B08A 029
1568            VMU3P=DMU3H*HP                                                  B08A 030
1569            HTILP=DHTILH*HP                                                 B08A 031
1570            TP=DTH*HP                                                       B08A 032
1571            RHOP(I)=DRHOH*HP                                                B08A 033
1572            IF(NSPM1)401,401,402                                            B08A 034
1573          402 DO 408 K=1,NSPM1                                              B08A 035
1574            ZKP(K)=DZKH(K)*HP                                               B08A 036
1575            PHIKP(K)=DPHIKH(K)*HP                                           B08A 037
1576            VMU4P=VMU4P+DMU4K(K)*SP(2,I,K)                                  B08A 038
1577            VMU3P=VMU3P+DMU3K(K)*SP(2,I,K)                                  B08A 039
1578            HTILP=HTILP+DHTILK(K)*SP(2,I,K)                                 B08A 040
1579            TP=TP+DTK(K)*SP(2,I,K)                                          B08A 041
1580            RHOP(I)=RHOP(I)+DRHOK(K)*SP(2,I,K)                              B08A 042
1581            DO 408 J=1,NSPM1                                                B08A 043
1582            ZKP(K)=ZKP(K)+DZKK(K,J)*SP(2,I,J)                               B08A 044
1583          408 PHIKP(K)=PHIKP(K)+DPHIKK(K,J)*SP(2,I,J)                       B08A 045
1584     C      NEXT, EVALUATE OTHER GROUPINGS FOR USE AT I AND I-1             B08A 046
1585     C    C*S DEFINED IN HISTXI -  C1=1.+DZ,C2=-C1-DZ,C3=-1./ALPHA*,C4=BETA+C1ENTR-MOD
1586     C    C*S DEFINED IN NONCER - C5=1./ALPH,C6=BETA*ALPH**2,              1ENTR-MOD
1587     C       C7=-(UE(IS)/ALPH)**2*25036.5,C8=ALPHD/ALPH,C9=C4-C8,          ENTR-MOD
1588     C       C10=C7*F(2,I),C13=C7*F(3,I)                                   ENTR-MOD
1589          401 C11=C5 * F(3,I) * TTVC
1590            C12 = C5 * CAPC(I)* TTVC
1591            C14=C1*F(1,I)+HF(I,5)                                           B08A 049
1592            C15=PR(I)-1.                                                    B08A 050
1593            C16=1./PR(I)                                                    B08A 051
1594            C17=1./SC(I)                                                    B08A 052
1595            C18=CTR*T(I)                                                    B08A 053
1596            C19=C17*C12                                                     B08A 054
1597            C20=C16*C12                                                     B08A 055
1598            C21 = C13 * C15
1599            C22 = C21*C20
1600            C23 = DCAFCH/CAPC(I)
1601            C24 = C20 * (G(2,I)-C21*F(2,I))
1602            C25= C20 * C16 * (G(2,I)+C13*F(2,I))
1603            C26 = RHOE(IS)/RHO(I)
1604            C28 = C12 * F(3,I)
1605            C31 = HTILP-(CPTIL+CT/VMU12*CTR)*TP+C18 * VMU3P+(HTIL-H(I)+CTR*
1606           1 VMU3* T(I)) *VMU4P
1607            C32 = (-F(2,I)*C13+TP/PR(I)*CPBAR(I)+C31/SC(I)) * C12 - C3*QR(I)
1608           1 *TTVC
1609            C43=C24*C23-C25*DPRH-C3*DQRH*TTVC
1610            C53=RHOP(I)/RHO(I)
1611            C56 = F(2,I)/ALPH
1612            C73 = C1 * F(2,I)
1613            C74 = C11 * C10 * DCAPCH + C14
1614            C75=C11*DCAPCH                                                  B08A 100
1615            C76=C1*G(1,I)                                                   B08A 101
1616            C77=-C22+C43*C10
1617            C78=-C20*C15*C10
1618            C79=C43
1619            C80=C20
1620            C81=-C28*(C10*C56*C23+C5)
1621            C82=-C20*C5*G(2,I)+3.0*C22*C56-C43*C10*C56
1622            C83=C28+C14 * F(2,I)
1623          412 C84=C32+G(1,I)*C14                                            B08A 109
1624            C85 = -C6/RHO(I)*C26/2.
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      C86=C85*C10*DRHOH
      C87=BETA*ALPH*C26-C86*C56
      C88=C85*DRHOH
      DUM1=C23-DSCH/SC(I)
      IF(NSPM1)403,403,404                                              B08A 110
  404 DO 406 K=1,NSPM1
      CK3(K) = DCAPCK(K)/CAPC(I)
  406 CK4(K)=CK3(K)-DSCK(K)/SC(I)
      DO 410 K=1,NSPM1
      DUM2=C19 * SP(2,I,K)
      CK1(K)=C24*CK3(K)-C25*DPRK(K)-C3*DQRK(K)*TTVC
      CK2(K)=0.
      CK5(K)=0.
      DUM3=ZK(K)-SP(1,I,K)
      CK6(K)=C19*(ZKP(K)+VMU4P*DUM3)
      CK9(K)= DUM2*DUM1
      CK13(K)=C85*DRHOK(K)
      CK14(K)=0.
      CK15(K)=0.
      CK16(K)=0.
      CK17(K)=C11*DCAPCK(K)                                             B08A 125
      CK18(K)=C1*SP(1,I,K)                                              B08A 126
      CK19(K)=CK9(K)*C10
      CK20(K)=0.
      CK21(K)=-CK19(K)*C56-DUM2/ALPH
  414 CK22(K)=CK6(K)+SP(1,I,K)*C14                                      B08A 130
      DO 410 KK=1,NSPM1                                                 B08A 131
      CKK1(K,KK)=C19*(DZKK(K,KK)+DUM3*DMU4K(KK))
      CKK3(K,KK)=DPHIKK(K,KK)
  410 CKK2(K,KK)=DUM2*CK4(KK)
  403 CONTINUE                                                          B08A 135
      RETURN                                                            B08A 136
      END                                                               B08A 137
CB09A                                                                   B09A 001
      SUBROUTINE RECASE                                                 B09A 002
      COMMON/CRBCOM/HCARB,EMIS,STEF,ADUM,BDUM,CDUM,HTEF,HMAT,EMISC,EMIST B09A   3
     1,HPG,ASU(3),BSU(3),HPYG(3),HCHAR(3),EMIV(3),KS(40),ISU            B09A   4
      COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)      B09A   5
     1,LAR(153),BA1(43,18),BA2(30,15)                                   B09A   6
      COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB09A   7
     1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B09A   8
     2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B09A   9
     3,KAUXO,JTIME,JSPEC,MD(3)                                          B09A  10
      COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) B09A  11
     1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO,  B09A  12
     2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                            B09A  13
    1 FORMAT(20I1,15A4)                                                 B09A 016
    2 FORMAT(I2)                                                        B09A 017
    3 FORMAT(I2/(8E10.4))                                               B09A 018
    4 FORMAT(1H1,14X,56HBOUNDARY LAYER INTEGRAL MATRIX PROGRAM (BLIMP)  B09A 019
     1      //,8X,47HAEROTHERM CORPORATION,PALO ALTO,CALIF (RMK,EPB)    B09A 020
     1,2X,3A6  //,1X,                                                  5H
     2CASE ,15A4,//,8X,75HCONTROL NUMBERS  1  2  3  4  5  6  7  8  9 10 B09A 022
     3 11 12 13 14 15 16 17 18 19 20,//,23X,20I3//,8X,14HPUNCH CONTROL  /,8X
     4 12HIDENT  JSPEC/10XA2,7XI2/)
    5 FORMAT(8E10.4)                                                    B09A 025
    6 FORMAT(I2,E10.4)                                                  B09A 027
    7 FORMAT(/9X,20HVISCOSITY LAW   MU=(E10.3,4H*T**E10.3,3H)/(E10.3,3H*T B09A 028
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1683          1+E10.3,1H)//9X19HENTHALPY LAW     T=E10.3,1H+E10.3,4H*H**E10.3,1H+ B09A 029
1684          2/42X2H((E10.3,7H+1.)*H/E10.3,8H)**(1./(E10.3, 5H+1.))//9X19HPRANDT B09A 030
1685          3L NUMBER  PR=E10.3,1H+E10.3,4H*T**E10.3,1H+E10.3,4H*T**E10.3/)     B09A 031
1686           9 FORMAT(21I1)                                                     B09A 032
1687          10 FORMAT    (/,10X70HU/UE TO  NODAL PT.   GAMMA   MOLECULAR       B09A 033
1688            1                        /9X18HNORM. ETA AT WHICH13X40HWEIGHT    B09A 034
1689            2                           /19X9HETA NORM.)                     B09A 035
1690           8 FORMAT(3X1PE10.3,9X12,6X9E10.3/(30X9E10.3))
1691          11 FORMAT     (/,5X70HU/UE TO       NODAL PT.                      B09A 037
1692            1     ETA VALUES        /4X23HNORM. ETA      AT WHICH           B09A 038
1693            2                           /19X9HETA NORM.)                     B09A 039
1694          12 FORMAT (/2X,15HNOSE RADIUS,FT ,1PE12.5,5X,16HCONE HALF ANGLE ,1PE1B09A 040
1695            12.5,8H DEGREES)                                                 B09A 041
1696          13 FORMAT (/,1X,23HTIME,SEC                ,1P8E12.5/(24X,1P8E12.5)) B09A 042
1697          14 FORMAT (/,1X,23HTOTAL ENTHALPY,BTU/LB   ,1P8E12.5/(24X,1P8E12.5)) B09A 043
1698          18 FORMAT (/,1X,23HCASE                    ,1P8E12.5/(24X,1P8E12.5))
1699          15 FORMAT (/,1X,23HTOTAL PRESSURE,ATM      ,1P8E12.5/(24X,1P8E12.5)) B09A 044
1700          16 FORMAT(A2,I2,I6)
1701          17 FORMAT (/,1X,23HINCIDENT RAD FLUX,B/SF2,1P8E12.5/(24X,1P8E12.5))
1702          20 FORMAT(/,1X,56HSURFACE RECESSION - WALL TEMPERATURE RELATION FOR T
1703            1EFLON//5X,43HSURFACE RECESSION RATE, LB/SEC FT2 = EXP(((,1P E12.5,
1704            26H)*TW+(,1P E12.5,7H))*TW+(,1P E12.5,2H)),//5X,37HWHERE TW IS WALL
1705            3 TEMPERATURE IN DEG R)
1706      C      NOTE...KR(5)=4 FOR EQUIL,3 FOR EQUIL WITH ENTROPY LAYER, 1        B09A 046
1707      C      FOR NONEQUIL, AND 2 FOR NONEQUIL WITH ENTROPY LAYER...ROKAP=1 FOR B09A 047
1708      C      PLANAR..(KR(6)=1 AND 3 FOR BLUNT AND SHARP, RESP) AND IS EQUAL TO B09A 048
1709      C      DISTANCE FROM AXIS OF SYMMETRY TO BODY SURFACE FOR AXISYM..       B09A 049
1710      C      (KR(6)=0 AND 2 FOR BLUNT AND SHARP, RESPECTIVELY)... KR(7)=0 FOR  B09A 050
1711      C      MULTICOMPONENT B.L. AND=1 FOR HOMOGENEOUS B.L..IDISC=0 FOR NO     B09A 051
1712      C      DISCONTINUITY AND UNITY FOR DISC. IN ROKAP,FW, OR RHOWVW          B09A 052
1713                 DATA MD(2)/6H       /
1714                 CALL DATE (9,MD)
1715                  CALL TOD ( 18, MD)
1716                 READ(KIN,1)KR,CASE                                           B09A 053
1717                 READ(KIN,16) IDENT,JSPEC,JTIME
1718                 WRITE(KOUT,4) MD,CASE,KR,IDENT,JSPEC
1719                 KQ(9)=0
1720                 IF(KR(6)-8) 245,240,245
1721           240   KQ(9)=-1
1722                 KR(6)=4
1723                 GO TO 255
1724           245   IF(KR(6)-4) 255,255,250
1725           250   KQ(9)=1
1726                 KR(6)=KR(6)-5
1727           255   READ(KIN,24) NSP,KS
1728            24   FORMAT(I2,8X70I1)
1729                 NSPM1=NSP-1                                                  B09A 057
1730                 READ(KIN,24)NTIME,IDISC                                      ENTR-MOD
1731                 READ(KIN,5)(TIME(IT),IT=1,NTIME)                             ENTR-MOD
1732                 NITEM=NTIME                                                  B09A 059
1733                 NTIME=1                                                      B09A 060
1734                 READ(KIN,24) NS,KR9
1735                 READ(KIN,5)(S(IS),IS=1,NS)
1736                 KAUXO=1                                                      ROG
1737                 IF(KR (14)-2) 303,303,302                                    ROG
1738           302   KAUXO=KR (14)-1                                              ROG
1739                 KR (14)=KR (14)-3                                            ROG
1740      C      COMPUTE INFORMATION NEEDED TO CONSIDER DISCONTINUITIES           B09A 062
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1741        303 J=1                                                                 B09A 063
1742        102 MSD(1)=1                                                            B09A 064
1743            IDISC(1)=MAX0(IDISC(1),1)                                           ENTR-MOD
1744            S(1)=ABS(S(1))                                                      B09A 066
1745            IF (NS-1) 105,105,1021                                              B09A 067
1746       1021 DO 101 IS=2,NS                                                      B09A 068
1747            IF(S(IS)) 103,101,101                                               B09A 070
1748        103 NSD(J)=IS-MSD(J)+1                                                  B09A 071
1749            S(IS )=-S(IS)                                                       B09A 072
1750            IDISC(IS)=MAX0(IDISC(IS),1)                                         ENTR-MOD
1751            J=J+1                                                               B09A 074
1752            MSD(J)=IS                                                           B09A 075
1753        101 CONTINUE                                                            B09A 076
1754        105 NSD(J)=NS-MSD(J)+1                                                  B09A 077
1755            NDISC=J-1                                                           B09A 078
1756            IF (KR(1)) 1051,1051,1052                                           B09A 080
1757       1052 READ (KIN,3) NETA,(ETA(I),I=1,NETA)                                 B09A 081
1758            READ (KIN,6) KAPPA,CBAR                                             B09A 079
1759       1051 CONTINUE                                                            B09A
1760        605 WRITE (KOUT,11)                                                     B09A 091
1761            WRITE (KOUT,8) CBAR,KAPPA,(ETA(I),I=1,NETA)                         B09A 092
1762        606 IF(KR(6)-1) 203,203,204                                             B09A 093
1763        203 READ (KIN,5)  CONE,          RNOSE                                  B09A 094
1764        204 IF(IABS(KR(6)-2)-1) 207,208,207                                     B09A 095
1765        207 READ (KIN,5)(ROKAP(IS),IS=1,NS)                                     B09A 096
1766            IF (NS-1) 234,234,2071                                              B09A 097
1767       2071 IIS=2                                                               B09A 098
1768            LNZ=1                                                               B09A 099
1769            IF(ROKAP(1)) 223,226,226                                            B09A 100
1770        223 RADNO=-ROKAP(1)                                                     B09A 101
1771            WRITE (KOUT, 12) RADNO,CONE                                         B09A 102
1772            ROKAP(1)=0.                                                         B09A 103
1773            DO 229 IS=1,NS
1774            IF(ROKAP(IS)) 224,224,225                                           B09A 105
1775        224 IF(KR(6)) 221,221,222                                               B09A 106
1776        222 ROKAP(IS)=S(IS)*SIN(RADNO/57.29578)                                 B09A 107
1777            GO TO 229                                                           B09A 108
1778        221 ROKAP(IS)=RADNO*SIN(S(IS)/RADNO)                                    B09A 109
1779        229 CONTINUE                                                            B09A 110
1780            GO TO 234                                                           B09A 111
1781        225 IF (IS-NS) 2251,234,234                                             B09A 112
1782       2251 IIS=IS+1                                                            B09A 113
1783            LNZ=IS                                                              B09A 114
1784        226 DO233 IS=IIS,NS                                                     B09A 115
1785            IF(ROKAP(IS)) 233,233,227                                           B09A 116
1786        227 IF(IS-1-LNZ) 232,232,228                                            B09A 117
1787        228 LNZ=LNZ+1                                                           B09A 118
1788            ROKAP(LNZ)=ROKAP(LNZ-1)+(S(LNZ)-S(LNZ-1))/(S(IS)-S(LNZ-1))*(ROKAP(B09A 119
1789           1IS)-ROKAP(LNZ-1))                                                   B09A 120
1790            GO TO 227                                                           B09A 121
1791        232 LNZ=IS                                                              B09A 122
1792        233 CONTINUE                                                            B09A 123
1793        234 VKAP=1.                                                             B09A 124
1794            GO TO 210                                                           B09A 125
1795        208 DO 209 IS=1,NS                                                      B09A 126
1796        209 ROKAP(IS)=1.                                                        B09A 127
1797            VKAP=0.                                                             B09A 128
1798        210 CONTINUE                                                            B09A
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1799        181 STEF = .481E-12
1800            IF (KR(9)-3) 197,193,198
1801        198 IF (KR(9)-4) 193,193,197
1802        197 DO 191 J=1,NS
1803            IF (KR9(J)-3) 191,193,192
1804        192 IF (KR9(J)-4) 191,193,191
1805        191 CONTINUE
1806            GO TO 199
1807        193 READ(KIN,21) (EMIV(I),HCHAR(I), HPYG(I), I=1,3)
1808            READ(KIN,22) (ASU(I),BSU(I), I=1,3)
1809         22 FORMAT(6A4)
1810         21 FORMAT(9E8.3)
1811         19 FORMAT(/1X39HQUASI-STEADY ENERGY BALANCE AT THE WALL//5X14HSURFACE
1812           1 NUMBER28X1H114X1H214X1H3/5X17HSURFACE EMITTANCE17X1P3E14.5/5X34HE
1813           2NTHALPY OF CHAR AT REFERENCE TEMP3E15.5/5X34HENTHALPY OF PYROLYSIS
1814           3 GAS (BTU/LB)3E15.5/5X27HEQUILIBRIUM SURFACE SPECIES5X3(7X2A4))
1815            WRITE(KOUT,19) EMIV, HCHAR, HPYG,(ASU(I), BSU(I), I=1,3)
1816        199 IF (KR(9)-5) 194,196,196
1817        194 DO 195 J=1,NS
1818            IF (KR9(J)-5) 195,196,196
1819        195 CONTINUE
1820            GO TO 182
1821        196 READ (KIN,5) EMIST,HTEF,ADUM,BDUM,CDUM
1822            WRITE (KOUT,20) ADUM,BDUM,CDUM
1823            WRITE (KOUT,19) EMIST,HTEF
1824        182 READ(KIN,5)(PTET(IT),IT=1,NITEM)
1825            READ(KIN,5)(GE(IT),IT=1,NITEM)                                  B09A 131
1826            READ(KIN,5)(RADFL(IT),IT=1,NITEM)                               B09A 132
1827       2200 IF(TIME(1)) 2201,220,220
1828       2201 TIME(1)=-TIME(1)
1829            WRITE (KOUT,18)(TIME(I),I=1,NITEM)
1830            TIME(1)=-TIME(1)
1831            GO TO 2202
1832        220 WRITE (KOUT,13)(TIME(I),I=1,NITEM)                              B09A 137
1833       2202 WRITE (KOUT,14)(  GE(I),I=1,NITEM)
1834            WRITE (KOUT,15)(PTET(I),I=1,NITEM)                              B09A 139
1835            WRITE (KOUT,17)(RADFL(I),I=1,NITEM)
1836            RETURN                                                          B09A 140
1837            END                                                             B09A 141
1838      C810A                                                                 B10A 001
1839            SUBROUTINE HISTXI                                               B10A 002
1840            COMMON/EDGCOM/             PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,ENTR-MOD
1841           1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMWE,CGE,C90  ENTR-MOD
1842           2,DSIP(40),IDSIP,TTVC,TVCC(40),HEA(40),SF(20),CS(20),CSPR(20),     ENTR-MOD
1843           3CG(20),CGP(20),SREF,GEP,NEN                                     ENTR-MOD
1844            COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)    B10A   3
1845           1,LAR(153),BA1(43,18),BA2(30,15)                                 B10A   4
1846            COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8B10A   5
1847           1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HHUE,HFN,DLX2  B10A   6
1848           2,C3M(40),BETAM(40)                                              B10A   7
1849            COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,META,I,IS,MB10A   8
1850           1S,IT,MTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,MRNL, ITS,KAPPA,CBAR,CASE(15) B10A   9
1851           2,B(8),      MWE,MON,KQ(10),ITEM,NITEM,KR17,MBT,MBT2,IDENT,KR9(40) B10A  10
1852           3,KAUXO,JTIME,JSPEC,MO(3),IU,ISM                                 ENTR-MOD
1853            COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) B10A  12
1854           1,RNOSE,VKAP,NOISC,IDISC(40),NSO(10),MSO(10),ITF( 50),IPRE,RADNO,  B10A  13
1855           2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                           B10A  14
1856            COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                   B10A  15
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1857            COMMON/HALCOM/FN(40, 1),TN(40, 1),HN(40, 1),SPN( 8,40, 1)          ENTR-MOD
1858           1,RHOVN(40, 1),FLUXJ( 3,40, 1),IHN,ITN,IFN,ISPN,IRHOVN,IFLUXJ      ENTR-MOD
1859            DIMENSION FD(4),GD(4),SPD(4)                                       B10A 018
1860      C     INITIALIZE AXIAL VARIATION TERMS                                   B10A 019
1861            NUL=0                                                              B10A 020
1862            IF(IS.NE.1)GO TO 399                                               ENTR-MOD
1863          398 IF(IDISC(IS).NE.2)GO TO 399                                      ENTR-MOD
1864            IS=IS+1                                                            ENTR-MOD
1865            GO TO 398                                                          ENTR-MOD
1866          399 IF(KR(3).EQ.0)GO TO 154                                          ENTR-MOD
1867            IF(IU-2) 154,152,155                                               ENTR-MOD
1868          152 DLX1=2.3                                                         ENTR-MOD
1869            IF(KR(6).EQ.0)DLX1=3.5                                             ENTR-MOD
1870            IF(XI(ISH)) 157,157,155                                            ENTR-MOD
1871          154 DZ=0.                                                            B10A 030
1872            D1=0.                                                              B10A 031
1873            D2=0.                                                              B10A 032
1874            IF(KR(2).LT.0) IS=-KR(2)
1875            IF(KR(2).LT.8) IDISC(IS)=1
1876            M=NETA-1                                                           B10A 033
1877            DO 140 I=1,M                                                       B10A 034
1878            DO 148 J=1,4                                                       B10A 035
1879            ZM(J,I)=0.                                                         B10A 036
1880          139 DO 140 K=NUL,NSPM1                                               B10A 037
1881            ZSP(J,I,K)=0.                                                      B10A 038
1882          140 CONTINUE                                                         B10A 039
1883            DO 141 I=1,NETA                                                    B10A 040
1884            DO 142 J=1,3                                                       B10A 041
1885            HF(I,J)=0.                                                         B10A 042
1886          159 DO 142 K=NUL,NSPM1                                               B10A 043
1887            HSP(I,J,K)=0.                                                      B10A 044
1888          142 CONTINUE                                                         B10A 045
1889            HF(I,4)=0.                                                         B10A 046
1890          141 HF(I,5)=0.                                                       B10A 047
1891            ALPHO=0.                                                           B10A 048
1892            HALPH=0.                                                           B10A 049
1893            DLX2=0.                                                            B10A 050
1894            GO TO 130                                                          B10A 051
1895      C     COMPUTE TWO- OR THREE-POINT DIFFERENCE RELATIONS                   B10A 052
1896          155 DLX1=ALOG(XI(IS)/XI(ISH))                                        ENTR-MOD
1897            IF(IU.GT.2.AND.KR(3).EQ.2.AND.IDISC(ISH).NE.1) GO TO 121           ENTR-MOD
1898          157 DZ=2./DLX1                                                       ENTR-MOD
1899            D1=-DZ                                                             B10A 054
1900            D2=0.                                                              B10A 055
1901            GO TO 145                                                          B10A 056
1902          121 DZ=DLX1+DLX2                                                     B10A 059
1903            D1=-DZ/(DLX1*DLX2)*2.                                              B10A 060
1904            D2=DLX1/(DZ*DLX2)*2.                                               B10A 061
1905            DZ=-D1-D2                                                          B10A 062
1906          145 DLX2=DLX1                                                        B10A 063
1907            ALPHO=D1*ALPH+D2*HALPH                                             B10A 064
1908            HALPH=ALPH                                                         B10A 065
1909          122 FD(3)=D1*F(4,1)+D2*HF(1,4)                                       B10A 066
1910            GD(3)=D1*G(3,1)+D2*HG(1,3)                                         B10A 067
1911            DO 147 I=2,NETA                                                    B10A 068
1912            FD(1)=D1*F(2,I)+D2*HF(I,2)                                         B10A 069
1913            FD(2)=D1*F(3,I)+D2*HF(I,3)                                         B10A 070
1914            FD(4)=FD(3)                                                        B10A 071
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1915            FD(3)=D1*F(4,I)+D2*HF(I,4)                                      B10A 072
1916            CALL TAYLOR(DETA(I-1),FD(2),FD(1),ZM(1,I-1))                    B10A 073
1917            GD(1)=D1*G(1,I)+D2*HG(I,1)                                      B10A 074
1918            GD(2)=D1*G(2,I)+D2*HG(I,2)                                      B10A 075
1919            GD(4)=GD(3)                                                     B10A 076
1920            GD(3)=D1*G(3,I)+D2*HG(I,3)                                      B10A 077
1921          147 CALL TAYLOR(DETA(I-1),GD(2),GD(1),ZG(1,I-1))                  B10A 078
1922            IF(NSPM1) 162,162,166                                           B10A 079
1923          166 DO 151 K=1,NSPM1                                              B10A 080
1924            SPD(3)=D1*SP(3,1,K)+D2*HSP(1,3,K)                               B10A 081
1925            DO 151 I=2,NETA                                                 B10A 082
1926            SPD(1)=D1*SP(1,I,K)+D2*HSP(I,1,K)                               B10A 083
1927            SPD(2)=D1*SP(2,I,K)+D2*HSP(I,2,K)                               B10A 084
1928            SPD(4)=SPD(3)                                                   B10A 085
1929            SPD(3)=D1*SP(3,I,K)+D2*HSP(I,3,K)                               B10A 086
1930          151 CALL TAYLOR (DETA(I-1),SPD(2),SPD(1),ZSP(1,I-1,K))            B10A 087
1931        C-----SAVE HISTORIC VALUES                                          B10A 088
1932          162 DO 164 I=1,NETA                                               B10A 089
1933            HF(I,4)=F(4,I)                                                  B10A 090
1934            HF(I,5)=D1*F(1,I)+D2*HF(I,1)                                    B10A 091
1935            DO 164 J=1,3                                                    B10A 092
1936            HF(I,J)=F(J,I)                                                  B10A 093
1937            HG(I,J)=G(J,I)                                                  B10A 094
1938            IF(NSPM1) 164,164,165                                           B10A 095
1939          165 DO 149 K=1,NSPM1                                              B10A 096
1940          149 HSP(I,J,K)=SP(J,I,K)                                          B10A 097
1941          164 CONTINUE                                                      B10A 098
1942        C     COMPUTE GROUPINGS WHICH DEPEND ON DZ                          B10A 099
1943          130 C1=1.+DZ                                                      B10A 100
1944            C2=-C1-DZ                                                       B10A 101
1945            C3=C3M(IS)                                                      B10A 102
1946            BETA=BETAN(IS)                                                  B10A 103
1947            C4=BETA+C1                                                      B10A 104
1948           9904 FORMAT(6X12/8X1P10E10.3/8X8E10.3/(8X10E10.3))               B10A 105
1949            IF(KR(17)) 9905,9906,9905                                       B10A 106
1950           9905 CONTINUE                                                    B10A 107
1951            WRITE(KOUT,9907)                                                B10A 108
1952           9907 FORMAT(2X27HDEBUG IS,DLX1...ZM,ZG,HF,HG)                    B10A 109
1953            WRITE(KOUT,9904) IS,DLX1,DLX2,DZ,D1,D2,ALPHC,HALPH,C1,C2,C4,    FOB10A 110
1954           1,GD,((ZM(I,J),J=1,6),I=1,4),((ZG(I,J),J=1,6),I=1,4),((HF(I,J),  B10A 111
1955           2 J=1,5),I=1,7),((HG(I,J),J=1,3),I=1,7)                          B10A 112
1956            IF(NSPM1) 9906,9906,9908                                        B10A 113
1957           9908 WRITE(KOUT,9909)(((ZSP(I,J,K),K=1,NSPM1),J=1,6),I=1,4),(((HSP(I,J,B10A 114
1958              1 K),K=1,NSPM1),J=1,3),I=1,7)                                 B10A 115
1959           9909 FORMAT(2X13HDEBUG ZSP,HSP/(2X10E10.3))                      B10A 116
1960           9906 CONTINUE                                                    B10A 117
1961            RETURN                                                          B10A 118
1962            END                                                             B10A 119
1963        C*B11A                                                              B11A 001
1964            SUBROUTINE OUTPUT                                               B11A 002
1965            DIMENSION GIJ( 71,1)                                            B11A  03
1966            COMMON/BLOCOM/  MOA( 71),  MOB( 71),MSPEC,FR( 71,15),W(3),LEF(10) B11A   4
1967           1 ,LEFS(10),PLEASE,LEFM(10),L2,L3                                ENTR-MO
1968            COMMON/COECOM/                C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15B11A   6
1969           1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31,CB11A   7
1970           232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48B11A   8
1971           3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,CB11A   9
1972           465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,CB11A  10
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      5,C82,C83,C84,C85,C86,C87,C88                                          B11A  11
       COMMON/COECON/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8)        B11A  12
      1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8)          B11A  13
      2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8)       B11A  14
      3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XM(5),XG(5),XCP(5, 9)     B11A  15
      4,CKK3( 8, 8)                                                          B11A  16
       COMMON/CRBCOM/HCARB,EMIS,STEF,ADUM,BDUM,CDUM,HTEF,HMAT,EMISC,EMIST    B11A  17
      1,HPG,ASU(3),BSU(3),HPYG(3, ,NCHAR(3),EMIV(3),KS(40),ISU               B11A  18
       COMMON/EDGCOM/              PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,  B11A  19
      1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,CUEDGE,D2UEDG,VMNE,CGE,C90      ENTR-MOD
      2,DSIP(40),IDSIP,TTVC,TVCC(40),HEA(40),SF(20),CS(20),CSPR(20),         ENTR-MOD
      3CG(20),CGP(20),SREF,GEP,NEN                                           ENTR-MOD
       COMMON/EPSCOM/ELCON,YAP,CLNUM,SCT,PRT,RED,OVS,RHOVS,PI,PIM,CL,        B11A  22
      1EPSA(15),EPS1,EL(15),DPI(15,2),DEPC,TREF,RETR                         ENTR-MOD
       COMMON/EQPCOM/  RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2),   B11A  24
      1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),WAT(10),      B11A  25
      2 KAT(10),IR(10),IZ,KZ(10),LAPI( 71),P,Z,TK(10, 7),VN( 71),            B11A  26
      3 VMU( 71,10),ITFF,KR2,HCH,NCV,NM,WTM( 71),YYY( 71),YM( 71),GG( 71)    B11A  27
      4 ,TQ(10, 7),EPOVRK,SIGMA,BASMOL                                       B11A  28
       COMMON/EQTCOM/SIP,HIP,EEL,EENL,FLIQ,CPF,IRE,IER,AA,IITS,IN,IL,IIT,    B11A  29
      1 MODE,MMELT,SMELT,TMAX,TMIN,MELT,SUMN,SUML,NS,NSS,BX,ISP2,ISPQ,       B11A  30
      2 ISP,KKJ,SVA,SVB,SVC,SVD,SURC,FFF,CMF,EP,RV,IFCJC,WTG,WTL,JC,MMG,     B11A  31
      3 CCPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),BB(16),        ENTR-MOD
      4 IP( 71),ALP(10),FNU(10),GAMN(10),GAMF(10),SLAM(10),DY( 71),RVS,      B11A  33
      5 CP( 71),HM( 71),SB( 71),TC( 71),VLNK( 71),E( 71),FNUS(10),           B11A  34
      6 BC(10),BLNK(10),BY(10),IBC(10),BE(10),JZ( 4)                         B11A  35
       COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)          B11A  36
      1,LAR(153),BA1(43,18),BA2(38,15)                                       B11A  37
       COMMON/FLXCOM/DELQW,DELJW( 9),DQNL(153),DJNL(153, 8),WALLQ            B11A  38
      1,WALLJ( 8),GW,VJKW( 9),TPWALL                                         B11A  39
       COMMON/HISCOM/C1,C2,C3,C4,ALPHO,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8)   B11A  40
      1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HHUE,HFW,DL(2      B11A  41
      2,C3M(40),BETAM(40)                                                    B11A  42
       COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,N    B11A  43
      1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15)     B11A  44
      2,B(8),      MWE,MON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40)     B11A  45
      3,KAUXO,JTIME,JSPEC,MD(3)                                              B11A  46
       COMMON/OUTCOM/Y(15),RES,DELST,THENG,,THMOM,CH,BLOW,SHEAR,CF,SHAPE      B11A  47
      1 ,CM( 9),TMELEM( 9)                                                   B11A  48
       COMMON/PRNCOM/TIME( 50),PRE(40),PTET( 50),CE( 50),S(40),ROKAP(40)     B11A  49
      1,RNOSE,VKAP,NDISC,IDISC(40),HSD(10),MSD(10),ITF( 50),IPRE,RADNO,      B11A  50
      2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                                B11A  51
       COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15)       B11A  52
      1,CPBAR(15),VMN(15),PHIK(15, 8),DRHON,DRHOK( 8),ZK( 8),DZKN( 8),  DB11A  53
      2RU3K( 8),DNUKK( 8),DTK( 8),DPHIKM( 8),DPRK( 8),DSCK( 8),DCAPCK( 8)B11A  54
      3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)    B11A  55
      4,DPHIKK( 8, 8),       DMUAN,DMU3N,DHTILN,VMU12,CT,CTR,CPTIL,HTIL     B11A  56
      5,VMU3,DTN,DCAPCN,DPRN,DSCN,CORN,DCPBN,DCPTN,DMU12N,VMU(15),  RHOP     B11A  57
      6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15)       B11A  58
       COMMON/TENCON/SPDUM( 8),DER(40),DUMM1(15),SLOPE(15),REDUM(15)         B11A  59
      1,SDUM1(40),SDUM2(40),FWDUM(40),XICON(40),FWCON(40),FWINIT( 1)         B11A  60
      2,XIINIT( 1),DUDS( 40)                                                 B11A  61
       COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                        B11A  62
       COMMON/WALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPW( 8,40, 1)             B11A  63
      1,RHOVW(40, 1),FLUXJ( 3,40, 1),IHW,ITW,IFW,ISPW,IRHOVW,IFLUXJ          B11A  64
       EQUIVALENCE              (VMU,CIJ)                                     B11A  65
      1 FORMAT(/6X109H ALPHA        XI      ROKAP     PRESSURE     EDGE      B11A  66
      2BETA     FLUX MOR-           HEAT FLUXES                    /5X110H
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2031          2          (LB          (FT)      (ATM)     VELOCITY              MALIZINGB11A 059
2032          3G DIFFUSIONAL TOT ENTH  RERAD       QCOND /5X110H               /SEC)
2033          4**2                    (FT/SEC)          PARAMETER
2034          5(BTU/SEC SQ FT)              /5X1P11E10.3)
2035         2 FORMAT(/6X109H  WALL                    MASS FLUXES                EL B11A 069
2036          1EMENTAL MASS DIFFUSIVE FLUXES (LB/SEC SQ FT) FOR          /5X 50H  B11A 070
2037          2SHEAR    MECH REM  PYROL GAS   CHAR    TOTAL GAS 8(1X2A4,1X))
2038        1? FORMAT                                          (5X 50H(LB/SQ FT) B11A 073
2039          3           (LB/SEC SQ FT)                       )                 B11A 074
2040         3 FORMAT(5X1P12E10.3)
2041        18 FORMAT(/5X109HMOM TRANS HEAT TRANS     BLOWING PARAMETERS        EL B11A 076
2042          1EMENTAL MASS TRANSFER COEFFICIENTS,                        /5X110H  B11A 077
2043          2COEFF,    COEFF,         (BASED ON CH) FOR            RHOE*UE*CM (LB B11A 078
2044          2B/SEC SQ FT) FOR                                  /4X51HRHO*UE*CF/2 B11A 079
2045          3RHO*UE*CH PYROL GAS   CHAR    TOTAL GAS                          B11A 080
2046          4 8(1X2A4,1X))
2047         4 FORMAT(5X110H MOMENTUM  DISPLACE. EFFECTIVE ENTHALPY  REYNOLDS  MA
2048          1SS THICKNESSES (FT) FOR                                   /5X110HTHB11A 083
2049          2ICKNESS,THICKNESS,   BODY   THICKNESS,  NUMBER
2050          3                                    /5X 50H  THETA    DELSTA B11A 085
2051          4R   DISPLACE.  LAMBDA   PER FOOT 8(1X2A4,1X))
2052        20 FORMAT(2X,4(6X,4H(FT))/5X1P12E10.3)
2053         5 FORMAT(/2X17HNODAL INFORMATION)                                  B11A 091
2054         6 FORMAT(5X9HDISTANCE,4X3HETA,8X1HF,9X2HFP,7X3HFPP,7X5HSHEAR,2X11HTO
2055          1TAL ENTH-,3X2HGP,7X3HGPP,6X6HSTATIC 5X4HTEMP,5X8HELECTRON/
2056          25X9HFROM WALL,23X7H(=U/UE),23X7HHALPY,G,23X8HENTHALPY,12X9HCOLL FR
2057          3EQ/8X4H(FT),44X9H(LB/FTSQ),2X8H(BTU/LB),2X8H(BTU/LB),2X8H(BTU/LB),
2058          42X8H(BTU/LB),2X7H(DEG R),4X7H(1/SEC))
2059         7 FORMAT(5X110H DISTANCE  DENSITY, VISCOSITY,  RHO*MU   SPECIFIC  THB11A 098
2060          1ERMAL   PRANDTL   MODIFIED MOLECULAR  RHOSQ*EPS    MACH  /5X110HFR
2061          2OM WALL    RHO         MU    /RHOE*MUE,   HEAT    COND (BTU  NUMBERB11A 100
2062          3   SCHMIDT    WEIGHT   /RHOE*MUE   NUMBER /5X110H   (FT)   (LB/CU
2063          4FT) LB/SEC FT    C      (BTU/LB R) /SEC FT R)           NUMBER     B11A 10
2064          5                        )                                         B11A 103
2065         8 FORMAT (/2X78HELEMENTAL FRACTIONS AND THEIR FIRST AND SECOND DERIVB11A 104
2066          1ATIVES WITH RESPECT TO ETA,/)                                     B11A 105
2067        12 FORMAT(/)                                                        B11A 126
2068        13 FORMAT(/   43X21HDISTANCE FROM WALL,FT/(15X,1P10E10.3/20X,
2069          1 1P9E10.3))
2070        14 FORMAT(6X,2A4,1X,1P10E10.3/20X,1P9E10.3/(15X,1P10E10.3/20X,1P
2071          1 9E10.3))
2072        15 FORMAT (15X,1P10E10.3/20X1P9E10.3)
2073        16 FORMAT (/2X14HMOLE FRACTIONS,/)                                  B11A 130
2074        17 FORMAT(/23H    SURFACE SPECIES IS 2A4)
2075       310 FORMAT(A2,3I2,1P6E12.5)                                          B11A 131
2076       312 FORMAT(A2,3I2,1P6E12.5/(8X,1P6E12.5))                            B11A 132
2077       313 FORMAT (A2,6X,18A4/(20A4))                                       B11A 133
2078           DATA IBLANK/2H  /
2079           TVCF(X)=(SQRT(AMAX1(0.,1.+2.*COSOR*X))-1.)/COSOR
2080           IF (KR(11)-1) 300,300,301                                        B11A 134
2081       300 IF(KR(9)) 302,302,307                                            B11A 135
2082       307 IF(KR(9)-2) 301,301,302                                          B11A 136
2083       302 RHOVW(IS,IT)= C1*F(1,1)   +HF(1,5)                               B11A 137
2084       301 C89=-C3*ALPH*VMUE(IS)                                            B11A 140
2085           DUM1=-1./C3                                                      B11A 141
2086           DUM2=RHOVW(IS,IT)/C3                                             B11A 142
2087           IF (UE(IS)-1.0) 3012,3011,3012                                   B11A 143
2088      3011 UE(IS)=0.                                                        B11A 144
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2089      3012 CONTINUE                                                    B11A
2090           WALLQ=-WALLQ/C3                                             B11A 147
2091           DER(3)=WALLQ-DUM2*G(1,1)                                    B11A 148
2092           WALLJ(NSP)=0.                                               B11A 149
2093           IF (NSPM1) 3051,3051,3050                                   B11A
2094      3050 DO 305 K=1,NSPM1                                            B11A
2095           WALLJ(K)=VJKW(K)                                            B11A 151
2096       305 WALLJ(NSP)=WALLJ(NSP)-WALLJ(K)                              B11A 152
2097      3051 CONTINUE                                                    B11A
2098           DER(1)=W(2)/C3                                              B11A 153
2099           DER(2)=W(3)/C3                                              B11A 154
2100           VMECH=DER(1)+DER(2)-DUM2                                    B11A 155
2101           DUM4=VMECH*100.                                             B11A 156
2102           IF (DUM4-DUM2) 1901,190,190                                 B11A 157
2103      1901 VMECH=0.                                                    B11A 158
2104       190 IF(ABS(BETA)-.0001) 303,304,304                             B11A 159
2105       303 BETA=0.                                                     B11A 160
2106       304 Y(1)=0.                                                     B11A 161
2107           SHFAC=-UE(IS)/(C3*ALPH*ALPH*32.174)
2108           DUDS(1)=(CAPC(1)+EPSA(1))*F(3,1)*SHFAC
2109           DO 182 I=2,NETA                                             B11A 162
2110           DUDS(I)=(CAPC(I)+EPSA(I))*F(3,I)*SHFAC
2111       182 Y(I)=Y(I-1)+C89*CRHO(I-1)                                   B11A 163
2112           QCOND=VMUE(IS)/PR(1)*CAPC(1)/C89*G(2,1)+DUM2*G(1,1)         B11A 164
2113           SHEAR=DUDS(1)
2114           IF (KR(9)-3) 2101,2102,2102
2115      2101 EMIS=0.
2116      2102 RERAD=(.481E-12)*(T(1))**4.*EMIS
2117           QDIFU=-CAPC(1)/ALPH*CPBAR(1)/PR(1)*TPWALL/C3
2118           WRITE (KOUT,1) ALPH,XI(IS),ROKAP(IS),PE(IS,IT),UE(IS),BETA,DUM1,
2119          1 WALLQ,DER(3),RERAD,QDIFU
2120       212 DUM1=RHOE(IS)*UE(IS)/VMUE(IS)                               B11A 179
2121           CH= WALLQ  /       (G(1,NETA)-G(1,1))                       B11A 180
2122           CF=CAPC(1)/ALPH*VMUE(IS)/C89*F(3,1)                         B11A 181
2123       213 WRITE(KOUT,2) (ATA(K),ATB(K),K=1,NSP)                       B11A 183
2124           WRITE (KOUT,19)                                             B11A 184
2125           DUM4=ALPH*ALPH                                              B11A 185
2126           DO 203 I=1,NETA                                             B11A 186
2127           SP(1,I,NSP)=1.0                                             B11A 187
2128           SP(2,I,NSP)=0.                                              B11A 188
2129       203 SP(3,I,NSP)=0.                                              B11A 189
2130           IF (NSPM1) 2021,2021,2020                                   B11A
2131      2020 DO 202 K=1,NSPM1                                            B11A
2132           DO 202 I=1,NETA                                             B11A 191
2133           SP(1,I,NSP)=SP(1,I,NSP)-SP(1,I,K)                           B11A 192
2134           SP(2,I,K)=SP(2,I,K)/ALPH                                    B11A 193
2135           SP(2,I,NSP)=SP(2,I,NSP)-SP(2,I,K)                           B11A 194
2136           SP(3,I,K)=SP(3,I,K)/DUM4                                    B11A 195
2137       202 SP(3,I,NSP)=SP(3,I,NSP)-SP(3,I,K)                           B11A 196
2138      2021 CONTINUE                                                    B11A
2139           XSP(5,NSP)=F(1,NETA)-F(1,1)                                 B11A 197
2140           IF(NSPM1) 2138,2138,2135
2141      2138 VJKW(1)=0.
2142           CM(1)=0.
2143           THELEM(1)=0.
2144           GO TO 2137
2145      2135 DO 2136 I=1,NSPM1                                           B11A
2146      2136 XSP(5,NSP)=XSP(5,NSP)-XSP(5,I)                              B11A 199
```

```
2147            DO 2131 I=1,NSP                                                  B11A 200
2148            VJKW(I)=0.                                                       B11A 201
2149            DO 2132 K=1,NSP                                                  B11A 202
2150         2132 VJKW(I)=VJKW(I)-WALLJ(K)/WTM(K)*CIJ(I,K)                       B11A 203
2151         2131 VJKW(I)=VJKW(I)*WAT(I)                                         B11A 204
2152         2137 CONTINUE
2153            WRITE(KOUT,3) SHEAR,VMECH,DER(1),DER(2),DUM2,    (VJKW(I),I=1,NSP) B11A 205
2154          214 RES=DUM1*S(IS)                                                 B11A 206
2155            DUM3=C89*(F(1,NETA)-F(1,1))/ALPH                                 B11A 207
2156            DELST=Y(NETA)-DUM3                                               B11A 208
2157            REDELS=DUM1*DELST                                                B11A 209
2158            THENGY=(DUM3*G(1,NETA)-C89/ALPH*XG(5))/(G(1,NETA)-G(1,1))        B11A 210
2159            RETHEN=DUM1*THENGY                                               B11A 211
2160            THMOM=DUM3-C89/ALPH*XM(5)/ALPH                                   B11A 212
2161            RETHMO=DUM1*THMOM                                                B11A 213
2162            DELBD=Y(NETA)-C89/ALPH*F(1,NETA)
2163            THCOND=CPBAR(1)/RHO(1)*RHOE(IS)/G(2,1)*C89*(T(NETA)-T(1))        B11A 215
2164            BLOW=DUM2/CH                                                     B11A 216
2165          207 BLOWPG=DER(1)/CH                                               B11A 218
2166            BLOWCH=DER(2)/CH                                                 B11A 219
2167            IF(NSPM1) 2074,2074,2070
2168         2070 DO 2071 I=1,NSP
2169            THELEM(I)=0.                                                     B11A 221
2170            DUZ=0.
2171            DO 2072 K=1,NSP                                                  B11A 223
2172            DUZ=DUZ+(DUM3*SP(1,NETA,K)-C89/ALPH*XSP(5,K))/WTM(K)*CIJ(I,K)
2173         2072 THELEM(I)=THELEM(I)+(SP(1,NETA,K)-SP(1,1,K))/WTM(K)*CIJ(I,K)   B11A 226
2174            CM(I)=VJKW(I)/(THELEM(1)*WAT(I))
2175         2071 THELEM(I)=DUZ/THELEM(I)
2176         2074 IF(KQ(9)) 2075,2078,2075
2177         2075 COSOR=-TVCC(IS)/VMUE(IS)*0.5/C3*FLOAT(KQ(9))
2178            DO 2076 I=1,NETA
2179            Y(I)=TVCF(Y(I))
2180         2076 DUDS(I)=DUDS(I)*(1.+COSOR*Y(I))
2181            DELST=TVCF(DELST)
2182            DELBD=TVCF(DELBD)
2183            THMOM=TVCF(THMOM)
2184            THENGY=TVCF(THENGY)
2185            DO 2077 K=1,NSP
2186         2077 THELEM(K)=TVCF(THELEM(K))
2187         2078 CONTINUE
2188            WRITE(KOUT,18) (ATA(K),ATB(K),K=1,NSP)                           B11A 228
2189            WRITE (KOUT,3) CF,CH,BLOWPG,BLOWCH,BLOW,(CM(I),I=1,NSP)          B11A 229
2190            WRITE(KOUT,12)                                                   B11A 232
2191            WRITE(KOUT,4) (ATA(K),ATB(K),K=1,NSP)                            B11A 233
2192            WRITE(KOUT,20) THMOM,DELST,DELBD,THENGY,DUM1,(THELEM(K),K=1,NSP)
2193          209 WRITE(KOUT,5)                                                  B11A 238
2194            WRITE(KOUT,6)                                                    B11A 239
2195            DO 183 I=1,NETA                                                  B11A 240
2196         C  COMPUTE TRUE VALUES OF F(I,J) AND ETA                            B11A 241
2197            DER(1)=F(1,I)
2198            DER(2)=F(2,I)/ALPH
2199            DER(3)=F(3,I)/DUM4
2200            DER(4)=DUDS(I)
2201            DER(5)=G(1,I)
2202            DER(6)=G(2,I)/ALPH
2203            DER(7)=G(3,I)/DUM4
2204            RETA=ETA(I)*ALPH
```

```
      DER(8)=5.814E+12*PE(IS,IT)/SQRT(T(I)/1.8)
  183 WRITE(KOUT,3) Y(I),RETA,(DER(J),J=1,7),
     1 H(I),T(I),DER(8)
      WRITE(KOUT,12)                                                    B11A 250
  216 WRITE(KOUT,7)                                                     B11A 258
      DO 184 I=1,NETA                                                   B11A 259
      COND=CPBAR(I)/PR(I)*VMU(I)                                        B11A 260
      GMR(I)=ABS(GMR(I))
      ACH=F(2,I)/ALPH*UE(IS)/SQRT(GMR(I)/VMW(I)*T(I)*49732.)
  184 WRITE(KOUT,3)Y(I),RHO(I),VMU(I),CAPC(I),CPBAR(I),COND,PR(I),SC(I),B11A 261
     1 VMW(I),EPSA(I),ACH
      IF (KR(7).EQ.1) GO TO 193
      WRITE(KOUT,13)(Y(I),I=1,NETA)                                     B11A 263
      WRITE(KOUT, 8)                                                    B11A 264
      DO 201 K=1,NSP                                                    B11A 265
      WRITE (KOUT,14) MOA(K),MOB(K),(SP(1,I,K),I=1,NETA)                B11A 266
      WRITE (KOUT,15)(SP(2,I,K),I=1,NETA)                               B11A 267
  201 WRITE (KOUT,15)(SP(3,I,K),I=1,NETA)                               B11A 268
      IF (NSPM1) 2041,2041,2040                                         B11A
 2040 DO 204 K=1,NSPM1                                                  B11A
      DO 204 I=1,NETA                                                   B11A 270
      SP(2,I,K)=SP(2,I,K)*ALPH                                          B11A 271
  204 SP(3,I,K)=SP(3,I,K)*DUM4                                          B11A 272
 2041 CONTINUE                                                          B11A
      WRITE (KOUT,16)                                                   B11A 273
      DO 196 J=1,NSPEC                                                  B11A 274
  196 WRITE(KOUT,14) MOA(J),MOB(J),(FR(J,I),I=1,NETA)                   B11A 275
      IF(KR(9).EQ.3.OR.KR(9).EQ.4) WRITE(KOUT,17) MOA(ISU),MOB(ISU)
  193 CONTINUE                                                          B11A 276
  325 WALLQ=-WALLQ*C3
      RETURN
      END                                                               B11A 307
C B11B
      SUBROUTINE FELTRU                                                 B11B 002
      DIMENSION HIW( 71,3),VKIE( 71),VKIW( 71),ZIE( 71),ZIW( 71),       B11B 003
     1ZIESTR( 71),ZIWSTR( 71),ZKWSRT( 9),ZKESRT( 9),ZKWSTT( 9),ZKESTT( 9B11B 004
     2),ZISDIF( 71),ZKDIF( 9),ZKTDIF( 9),CMK( 9)                        B11B 005
      DIMENSION CIJ( 71,1)                                              B11B  06
      COMMON/BLQCOM/  MOA( 71),  MOB( 71),NSPEC,FR( 71,15),W(3),LEF(10) B11B   7
     1 ,LEFS(10),PIEASE,LEFW(10),L2,L3                                  ENTR-MOD
      COMMON/COECON/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8)    B11B   9
     1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8)      B11B  10
     2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8)   B11B  11
     3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XH(5),XG(5),XSP(5, 9)  B11B  12
     4,CKK3( 8, 8)                                                      B11B  13
      COMMON/GRBCOM/HCARB,EMIS,STEF,ADUM,BDUM,CDUM,HTEF,HMAT,EMISC,EMIST B11B  14
     1,HPG,ASU(3),BSU(3),HPYG(3),HCHAR(3),EMIV(3),KS(40),ISU            B11B  15
      COMMON/EDGCOM/              PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,B11B  16
     1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMWE,HE,C90   B11B  17
     2 ,DSIP(40),IDSIP,TTVC,TVCC(40)                                    B11B  18
      COMMON/EPSCOM/ELCON,YAP,CLNUM,SCT,PRT,RED,DVS,RHOVS,PI,PIM,CL,     B11B  19
     1 EPSA(15),EPS1,EL(15),DPI(15,2),DEPC,YREF,RETR,VINTR(15)          ENTR-MOD
      COMMON/EQPCOM/  RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2),B11B  21
     1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),WAT(10),  B11B  22
     2 KAT(10),IR(10),IZ,KZ(10),LAMI( 71),P,Z,TK(10, 7),VN( 71),        B11B  23
     3 VNU( 71,10),ITFF,KR2,HCH,NCV,WM,WTN( 71),YYY( 71),YW( 71),GG( 71)B11B  24
     4 ,TQ(10, 7),EPSVRK,SIGMA,ZASMOL                                   B11B  25
      COMMON/EQTCOM/SIP,HIF,EEL,EENL,FLIQ,CPF,IRE,IER,AA,IITS,IN,IL,IIT,B11B  26
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2263          1 MODE,HMELT,SMELT,TMAX,TMIN,MELT,SUMN,SUML,WS,WSS,BX,ISP2,ISPQ,    B11B  27
2264          2 ISP,KKJ,SVA,SVD,SVC,SVD,SUMC,FFF,CMF,EP,RV,IFCJC,WTG,WTL,JC,HHG,  B11B  28
2265          3 CCPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),BB(16),     ENTR-MOD
2266          4 IP( 71),ALP(10),FNU(10),GAMH(10),GAMF(10),SLAM(10),DY( 71),RVS,   B11B  30
2267          5 CP( 71),HH( 71),SB( 71),TC( 71),VLNK( 71),E( 71),PNUS(10),        B11B  31
2268          6 BC(10),BLNK(10),BY(10),IBC(10),BE(10),JZ( 4)                      B11B  32
2269           COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)       B11B  33
2270          1,LAR(153),BA1(43,18),BA2(30,15)                                    B11B  34
2271           COMMON/FLXCOM/DELQW,DELJW( 8),DQNL(153),DJNL(153, 8),WALLQ         B11B  35
2272          1,WALLJ( 8),QW,VJKW( 9),TPWALL                                      B11B  36
2273           COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8B11B  37
2274          1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HHUE,HFW,DLX2   B11B  38
2275          2,C3M(40),BETAM(40)                                                 B11B  39
2276           COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB11B  40
2277          1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B11B  41
2278          2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40)  B11B  42
2279          3,KAUXO,JTIME,JSPEC,MD(3)                                           B11B  43
2280           COMMON/OUTCOM/Y(15),RES,DELST,THENGY,THMOM,CH,BLOW,SHEAR,CF,SHAPE   B11B  44
2281          1 ,CM( 9),THELEM( 9)                                                B11B  45
2282           COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40)   B11B  46
2283          1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO,   B11B  47
2284          2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                             B11B  48
2285           COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15)     B11B  49
2286          1,CPBAR(15),VMW(15),PHIK(15, 8),DRHOH,DRHOK( 8),ZK( 8),DZKH( 8),  DB11B  50
2287          2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8)B11B  51
2288          3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)    B11B  52
2289          4,DPHIKK( 8, 8),      DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL    B11B  53
2290          5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15),  RHOP B11B  54
2291          6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15)    B11B  55
2292           COMMON/TEMCOM/SDUM( 8),DER(40),DUMM1(15),SLOPE(15),REDUM(15)       B11B  56
2293          1,SDUM1(40),SDUM2(40),FWDUM(40),XICON(40),FWCON(40),FWINIT( 1)      B11B  57
2294          2,XIINIT( 1),DUDS( 40)                                              B11B  58
2295           COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                     B11B  59
2296           COMMON/WALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPW( 8,40, 1)          B11B  60
2297          1,RHOVW(40, 1),FLUXJ( 3,40, 1),IHW,ITW,IFW,ISPW,IRHOVW,IFLUXJ       B11B  61
2298           DIMENSION GAM(10),TWC(3),SHWFP(3),SHWFE(3),SDPTIL(3),SDP(3),CHA(3) B11B
2299          1,CME(3),CHE(3),RAT1(3),RAT2(3),RAT3(3),TITL(3),QCHEM(3)            B11B
2300           EQUIVALENCE              (VNU,CIJ)                                 B11A 037
2301         310 FORMAT(A2,3I2,1P6E12.5)                                          B11A 131
2302         312 FORMAT(A2,3I2,1P6E12.5/(8X,1P6E12.5))                            B11A 132
2303         313 FORMAT (A2,6X,18A4/(20A4))                                       B11A 133
2304         316 FORMAT(E12.4,3X3A6,2X2A4,3X13HMASS FRACTION /(35X2A4) )          RDG
2305         317 FORMAT(40I2)                                                     RDG
2306         318 FORMAT(E12.4,3X3A6,2X2A4,3X13HMOLE FRACTION )                    RDG
2307         319 FORMAT(3(13X9(2H**),14HNON-CONVERGENT 9(2H**)/))                 RDG
2308         320 FORMAT(F12.4,3X3A6,2X11A4)                                       RDG
2309         321 FORMAT(5X65(1H*)/20X27HFOLLOWING CARDS FOR RESTART  )            RDG
2310         322 FORMAT(5X65(1H*)/10X27HFOLLOWING -NTH SPECIES DATA/5X65(1H*))    RDG
2311         323 FORMAT(5X65(1H*)/30X17HEND RESTART CARDS)                        RDG
2312         324  FORMAT(5X65(1H*)/30X21HFOLLOWING SPECIE DATA/5X65(1H*)/E12.4,3X3ARDG
2313            16,2X11A4)                                                       RDG
2314         325 FORMAT(3E10.3,5X,I5,22X,3A6)                                     ENTR-MOD
2315         481 FORMAT(//38X43HELEMENTAL MASS TRANSPORT DRIVING POTENTIALS//19X 7HRDG
2316            1ELEMENT 5X8HZKETILDA8X8HZKWTILDA7X10HDIFFERENCE5X11HMOLE-ZKETIL5X1RDG
2317            21HMOLE-ZKWTIL 5X10HDIFFERENCE/(4XI5,9X2A4,6(3X1PE12.4)) )       RDG
2318         482 FORMAT(/9XA4,2X0PF6.0,2X7(2X1PE12.4))                            RDG
2319         483 FORMAT(//10X3HAVG3X4HBASE 9X3HCME11X3HCHE 9X7HCME/CHE             RDG
2320            19X8HRATIO-CM 6X8HRATIO-CH 8X                                    RDG
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2321          23HCHL10X5HQCHEM/16X4HTEMP//)                                          RDG
2322        490 FORMAT(1H148X24HUNEQUAL DIFFUSION OUTPUT///17X20HDIFFUSIVE HEAT FLRDG
2323          1UX=1PE12.4,11X9HBASE TEMP16X5HSHBFE16X6HSHDBFE/3(61X0PF6.0,14X2(1PRDG
2324          1E12.4,10X)/                                                           RDG
2325          2)///2X2(6HSPECIE18X8HENTHALPY33X)/2(18X3HTB=0PF6.0,6X3HTB=F6.0,6X3RDG
2326          3HTB=F6.0,10X)                                                         RDG
2327          4         //(3X2A4,2X3(    2X1PE12.4),13X2A4,2X3(2X1PE12.4)))       RDG
2328        491 FORMAT (1H142X33HEQUAL DIFFUSION ADDITIONAL OUTPUT ///10X6HSPECIE3RDG
2329          10X8HENTHALPY24X9HWALL MASS 8X9HEDGE MASS/27X3HTB=F6.0,9X3HTB=F6.0,RDG
2330          29X3HTB=F6.0, 8X8HFRACTION9X8HFRACTION                                 RDG
2331          3         //(11X2A4,5(5X1PE12.4)))                                     RDG
2332        492 FORMAT(//10X9HBASE TEMP8X9HRHO UE CH  X8HRATIO-CM10X8HRATIO-CH11X5RDG
2333          2HCM/CH11X5HQCHEM//(11X0PF6.0,3X5(5X1PE12.4)))                         RDG
2334        494 FORMAT(                              //42X36HGAMMA DEPENDENT TRRDG
2335          1ANSPORT PROPERTIES//55X 6HGAMMA=F4.2///48X23HFILM DRIVING POTENTIARDG
2336          2LS//2X2(   6HSPECIE10X6HZIESTR10X6HZIWSTR6X10HDIFFERENCE11X)///(3X2RDG
2337          3A4,2X3(2X1PE12.4),13X2A4,2X3(2X1PE12.4)))                             RDG
2338        496 FORMAT(//47X9HBASE TEMP16X5HSCMDP//3(48X0PF6.0,12X1PE12.4/)//35X9HRDG
2339          3LEWIS-2/34X6HSMDIF1                                                   RDG
2340          2    6X6HSMDIF2 6X 6HSUMZDF//32X4(1PE12.4)                            RDG
2341          1         //46X36HELEMENTAL MASS TRANSPORT COEFFICIENT  //            RDG
2342          249X7HELEMENT10X14H RHOE UE CM(K)/                                     RDG
2343          4         (/ 34XI5,9X2A4,1(10X1PE12.4)))                             RDG
2344        497 FORMAT(//(20X2I5,5X1PE12.4))                                         RDG
2345        498 FORMAT(E12.4,1X3A6,1X4(1PE12.4)/(2X,2A4,5X1PE12.4))                  RDG
2346        499 FORMAT(E12.4,3X3A6,2I5,2(1PE12.4))                                   RDG
2347        514 FORMAT(E12.4,3X3A6,2X3I5/(8(1PE10.4)))                               RDG
2348        515 FORMAT(8E10.3)                                                       ENTR-MOD
2349        516 FORMAT(E12.4,1X3A6,1X4(1PE12.4)/6X6(1PE12.4))                        RDG
2350        517 FORMAT(//31X2HCM15X3HCHL11X6HCM/CHL11X5HQWALL//19X4(5X(1PE12.4))//RDG
2351          1)                                                                     RDG
2352        518 FORMAT(27X9HBASE TEMP10X5HSCMDP12X5HSHBFE11X6HSHDBFE//(30X0PF6.0,3RDG
2353          1(5X1PE12.4)))                                                         RDG
2354           DATA GAM(1),GAM(2),GAM(3),GAM(4),GAM(5),GAM(6),GAM(7),NGAM/0.0,0.2RDG
2355          1,0.4,0.6,0.8,1.0,1.5,7/                                               RDG
2356           DATA TITL(1),TITL(2),TITL(3)/4HMEAN,4HMASS,4HMOLE  /                  RDG
2357           DATA IFG/2HFG/,IBO/2HBO/                                              RDG
2358           DATA IBLANK/2H  /
2359           NUL=0
2360           WALLQ=-WALLQ/C3
2361           VLEX=(PR(1)/SC(1))**(2./3.)
2362           RERAD = (.481E-12) * (T(1))**4. * EMIS
2363           DUM1 = RHOE(IS)*UE(IS)/VMUE(IS)
2364           DUM2 = RHOVW(IS,IT)/C3
2365           TIMEO=ABS(TIME(ITEM) )
2366           IF(NON) 621,622,611
2367        621 IF(JTIME) 611,405,405
2368        622 IF(IDENT-IBLANK) 194,309,194
2369        194 IF(IDENT-IFG) 308, 607,308
2370        611 PUNCH 319
2371           GO TO 607
2372        308 DUM3=RHOE(IS)*UE(IS)                                                 B11A 278
2373           DUM4=-1./C3                                                           B11A 279
2374           PUNCH 320,TIMEO,MD,(CASE(I),I=1,11)
2375           L=0                                                                   B11A 280
2376           PUNCH 310,IDENT,L,IS,ITEM,RADNO,CONE,GE(ITEM),PTET(ITEM),S(IS),       B11A 281
2377          1 TIME(ITEM)                                                           B11A 282
2378           IF (IS+ITEM-2) 315,314,315                                            B11A 283
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2379      314 PUNCH 313, IDENT,(MOA(J),MOB(J),J=1,NSPEC),(ATA(J),ATB(J),J=1,NSP)B11A 284
2380      315 L=1                                                               B11A 285
2381          PUNCH 310,IDENT,L,IS,ITEM,DUM2,T(1),PE(IS,1),BLOW,CH,CF           B11A 286
2382          L=2                                                               B11A 287
2383          PUNCH 310,IDENT,L,IS,ITEM,WALLQ,DER(3),RERAD
2384          L=3                                                               B11A 289
2385          PUNCH 310,IDENT,L,IS,ITEM,DUM4,DUM3,DUM1,UE(IS),PR(1),SC(1)       B11A 290
2386          L=4                                                               B11A 291
2387          PUNCH 310,IDENT,L,IS,ITEM,CAPC(1),SHEAR,DELST,THMOM,SHAPE,THENGY  B11A 292
2388          IF (KR(7)) 309,311,309                                            B11A 293
2389      311 L=5                                                               B11A 294
2390          PUNCH 310,IDENT,L,IS,ITEM,(VJKW(J),J=1,NSP)                       B11A 295
2391          L=6                                                               B11A 296
2392          PUNCH 310,IDENT,L,IS,ITEM,(  GM(J),J=1,NSP)                       B11A 297
2393          L=7                                                               B11A 298
2394          PUNCH 310,IDENT,L,IS,ITEM,(THELEM(J),J=1,NSP)                     B11A 299
2395          L=8                                                               B11A 300
2396          PUNCH 312,IDENT,L,IS,ITEM,(FR(J,1),J=1,NSPEC)                     B11A 301
2397          L=9                                                               B11A 302
2398          PUNCH 312,IDENT,L,IS,ITEM,(FR(J,NETA),J=1,NSPEC)                  B11A 303
2399          IF(IDENT-IBO) 606,607,606
2400      606 IF(IDENT-IFG) 608,607,608
2401      607 IF(IDISC(IS)) 608,608,609
2402      609 PUNCH 320,TIMEO,MD,(CASE(I),I=1,11)
2403          PUNCH 514,TIMEO,MD,NSP,NSPEC,NETA,(Y(I),I=1,NETA)
2404          PUNCH 316,TIMEO,MD,(MOA(K),MOB(K),K=1,NSP)
2405          PUNCH 321
2406          ALSQ=ALPH*ALPH
2407          DER(1)=F(3,1)/ALSQ
2408          PUNCH 325,ALPH,F(1,1),DER(1),IS,MD
2409          DO 603 J=1,NETA
2410      603 DER(J)=F(2,J)/ALPH
2411          PUNCH 515,(DER(J),J=1,NETA)
2412          DO 601 K=NUL,NSPM1
2413          DER(1)=SP(2,1,K)/ALPH
2414      601 PUNCH 515,DER(1),(SP(1,J,K),J=1,NETA)
2415          PUNCH 317,(LEF(K),K=1,NSP)
2416          PUNCH 323
2417      608 IF(NON) 405,309,405
2418      309 IF(JSPEC) 624,623,624
2419      624 PUNCH 324,TIMEO,MD,(CASE(I),I=1,11)
2420          PUNCH 514,TIMEO,MD,NSP,NSPEC,NETA,(Y(I),I=1,NETA)
2421          DO 602 J=1,NSPEC
2422          PUNCH 318,TIMEO,MD,MOA(J),MOB(J)
2423      602 PUNCH 515, (FR(J,I),I=1,NETA)
2424      623 GO TO (405,404,404,404),KAUXO
2425      404 TWC(1)=T(1) / 1.8
2426          TWC(3)=T(NETA)/1.8
2427          TWC(2)=(TWC(1)+TWC(3))/2.0
2428          SOP(1 )=0.
2429          SOP(2 )=0.
2430          SOP(3 )=0.
2431          SUME=0.
2432          SUMW=0.
2433          SUMZIE=0.0
2434          SUMZIW=0.0
2435          DO 1001 LT=1,3
2436          TB = TWC(LT)-3000.0
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```
2437            TCC=(TWC(LT)+3000.0)/2.0
2438            TD = TWC(LT)* 3000.0
2439            SHWFE (LT)= 0.0
2440              SHWFP(LT)=0.0
2441            DO 400 I=1,NSPEC
2442             IF(IFC(I)) 419,418,419
2443          419 IF(IABS(IFC(I)) - 3) 420,418,420
2444          420 ZIW(I)=0.0
2445            ZIE(I)=0.0
2446            GO TO 400
2447          418 VKIE(I) = WTM(I) * FR(I,NETA)/VMW(NETA)
2448            VKIW(I) = WTM(I) * FR(I,1)/VMW(1)
2449            IF(TU(I,1)-TWC(LT)) 401,402,402
2450          401 KT=2
2451            GO TO 403
2452          402 KT=1
2453          403 HIW(I,LT)=(RB(I,KT)+TB*(RC(I,KT)+RD(I,KT)*TCC+RE(I,KT
2454             1)/TD))* 1.8/WTM(I)
2455            SDP(LT) = SDP(LT) + (VKIE(I)-VKIW(I)) * HIW(I,LT)
2456              SHWFP(LT)=SHWFP(LT)+VKIW(I)*(HIW(I,1)-HIW(I,LT))
2457            SHWFE(LT) = SHWFE(LT) + HIW(I,LT) * VKIE(I)
2458            GO TO (400,406,406,400),KAUXO
2459          406 ZIE(I)=VKIE(I)*VMW(NETA)/FF(I)
2460            SUMZIE=SUMZIE + ZIE(I)
2461            ZIW(I) = VKIW(I)*VMW(1)/FF(I)
2462            SUMZIW = SUMZIW + ZIW(I)
2463          400 CONTINUE
2464         1001 CONTINUE
2465            IF(KAUXO-4) 408,417,405
2466          417 CHL=CM(NSP)/VLEX
2467            DO 1417 LT=1,3
2468            QCHEM(LT)=WALLQ-CM(NSP)*SDP(LT)-CHL*(G(1,NETA)-SHWFE(LT)-SHWFP(LT)
2469           1)
2470            CHA(LT) = (WALLQ-CM(NSP) * SDP(LT))/(G(1,NETA)-SHWFE(LT)-SHWFP(LT)
2471           1)
2472            RAT1(LT)=SDP(LT)/WALLQ*CM(NSP)
2473             RAT2(LT)=(G(1,NETA)-SHWFE(LT)-SHWFP(LT))/WALLQ*CHA(LT)
2474         1417 RAT3(LT)=CM(NSP)/CHA(LT)
2475            WRITE (KOUT,491)(TWC(LT),LT=1,3), (MOA(I),MOB(I),(HIW(I,LT),LT=1,3
2476           1),VKIW(I),VKIE(I),I=1,NSPEC)
2477            CMCHL=CM(NSP)/CHL
2478            WRITE(KOUT,517) CM(NSP),CHL,CMCHL, WALLQ
2479             WRITE(KOUT,518)(TWC(LT),SDP(LT),SHWFE(LT),SHWFP(LT),LT=1,3)
2480            WRITE (KOUT,492)(TWC(LT),CHA(LT),RAT1(LT),RAT2(LT),RAT3(LT),QCHEM(
2481           1LT),LT=1,3)
2482            GO TO 405
2483          408 DO 409 I=1,NSPEC
2484            ZIE(I) = ZIE(I) / SUMZIE
2485            ZIW(I) = ZIW(I)/SUMZIW
2486            SUME=SUME+ZIE(I)
2487          409 SUMW=SUMW+ZIW(I)
2488            PUNCH 320,TIMEO,MD,(CASE(I),I=1,11)
2489            PUNCH 499,TIMEO,MD,NGAM,NSP,PE(IS,IT),M(NETA)
2490            WRITE(KOUT,490) WALLQ,(TWC(LT),SHWFE(LT),SHWFP(LT),LT=1,3),(TWC(LT
2491           1),LT=1,3),(TWC(LT),LT=1,3),(MOA(I),MOB(I),
2492           2(HIW(I,LT),LT=1,3),I=1,NSPEC)
2493            ISP=IZ+1
2494            DO 410 L=1,NGAM
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```
2495            SUME=0.
2496            SUMW=0.
2497            SUMZIE=0.0
2498            SUMZIW=0.0
2499            BETS= 1-GAM(L)
2500            DO 411 I=1,NSPEC
2501            ZIESTR(I)=ZIE(I) ** GAM(L) * VKIE(I)   ** BETS
2502            ZIWSTR(I)=ZIW(I) ** GAM(L) * VKIW(I) ** BETS
2503            SUMZIE=SUMZIE+ZIESTR(I)
2504          411 SUMZIW=SUMZIW + ZIWSTR(I)
2505            SDPTIL(1) = 0.0
2506            SDPTIL(2) = 0.0
2507            SDPTIL(3) = 0.0
2508            CMKA=0.0
2509             CMKB=0.0
2510            SUMELT = 0.0
2511            SUMSDF=0.0
2512            DO 414 I=1,NSPEC
2513            ZIESTR(I) = ZIESTR(I)/SUMZIE
2514            ZIWSTR(I)=ZIWSTR(I) / SUMZIW
2515            ZISDIF(I)=ZIESTR(I)-ZIWSTR(I)
2516            SUMSDF=SUMSDF+ZISDIF(I)
2517            DO 414  LT=1,3
2518          414 SDPTIL(LT) = SDPTIL(LT) +(ZIESTR(I)-ZIWSTR(I)) * HIW(I,LT)
2519            SMDIF1=0.0
2520            SMDIF2=0.0
2521            DO 413 KK=1,NSP
2522            IF (LEF(KK)-0) 416,416,415
2523          416 CMK(KK)=0.0
2524            GO TO 413
2525          415 ZKESRT(KK)=0.0
2526            ZKWSRT(KK)=0.0
2527            ZKESTT(KK)=0.0
2528            ZKWSTT(KK)=0.0
2529            DO 421 I=1,NSP
2530            BETS=CIJ(KK,I)/WTM(I)*WAT(KK)
2531            ZKESRT(KK)=ZKESRT(KK)+BETS*ZIESTR(I)
2532          421 ZKWSRT(KK)=ZKWSRT(KK)+BETS* ZIWSTR(I)
2533            DO 412 I=ISP,NSPEC
2534            DO 412 K=1,NSP
2535            BETS=VNU(I,K)*CIJ(KK,K)/WTM(I)*WAT(KK)
2536            ZKESRT(KK) = ZKESRT(KK) + BETS * ZIESTR(I)
2537          412 ZKWSRT(KK)=ZKWSRT(KK) + BETS*ZIWSTR(I)
2538            ZKDIF(KK)=ZKESRT(KK)-ZKWSRT(KK)
2539            SMDIF1=SMDIF1+ABS(ZKESRT(KK)-ZKWSRT(KK))
2540            ZKESTT(KK)=ZKESRT(KK)/WAT(KK)*VMW(NETA)
2541            ZKWSTT(KK)=ZKWSRT(KK)/WAT(KK)*VMW(1)
2542            ZKTDIF(KK)=ZKESTT(KK)-ZKWSTT(KK)
2543            SMDIF2=SMDIF2+ABS(ZKESTT(KK)-ZKWSTT(KK))
2544            CMK(KK)=VJKW(KK)/(ZKESRT(KK)-ZKWSRT(KK))
2545            CMKA=CMKA+CMK(KK)
2546            SUMELT=SUMELT + 1.0
2547          413 CONTINUE
2548            WRITE(KOUT,494) GAM(L),(  MCA(I),MOB(I),ZIESTR(I),ZIWSTR(I),ZISDIF
2549           1(I),I=1,NSPEC)
2550            WRITE(KOUT,481) (K,ATA(K),ATB(K),ZKESRT(K),ZKWSRT(K),ZKDIF(K),ZKES
2551           1TT(K),ZKWSTT(K),ZKTDIF(K)        ,K=1,NSP)
2552            WRITE(KOUT,496)(TMC(LT),SDPTIL(LT),LT=1,3),VLEX,SMDIF1,SMDIF2,SUMS
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      1DF,(K,ATA(K),ATB(K),CMK(K),K=1,NSP)
       WRITE(KOUT,483)
       DO 680 LL=1,3
       CME(LL)=0.0
       GO TO (643,    645,646),LL
  643 CME(LL)=CMKA/SUMELT
       GO TO 647
  645 DO 667 K=1,NSP
       IF(LEF(K)) 667,667,666
  666 CME(LL)=CME(LL)+ABS(VJKH(K)  )
  667 CONTINUE
       CME(LL)=CME(LL)/SMDIF1
       GO TO 647
  646 DO 668 K=1,NSP
       IF(LEF(K)) 668,668,665
  665 CME(LL  )=CMK(K )* ABS(ZKESTT(K)-ZKWSTT(K))  +CME(LL)
  668 CONTINUE
       CME(LL)=CME(LL)/SMDIF2
  647 CHL=CME(LL)/VLEX
       DO 1009 LT=1,3
        QCHEM(LL)=WALLQ-CME(LL)*SDPTIL(LT) -CHL*(G(1,NETA)-SHWFE(LT)-SHWF
      1P(LT))
       CME(LL)=(WALLQ-CME(LL) * SDPTIL(LT))/(G(1,NETA)-SHWFE(LT)-SHWFP(LT
      1))
       RAT1(LL)= SDPTIL(LT)/WALLQ*CME(LL)
       RAT2(LL)= (G(1,NETA) -SHWFE(LT)-SHWFP(LT))/WALLQ*CME(LL)
       RAT3(LL)=CME(LL)/CHE(LL)
       WRITE (KOUT,482)TITL(LL),TMC(LT), CME(LL),CHE(LL),RAT3(LL),
      1RAT1(LL),RAT2(LL),CHL,QCHEM(LL)
       IF (IDENT-IBLANK) 1410,1009,1410
 1410 PUNCH 516,TIMEO,MD,PE(IS,IT),H(NETA),GAM(L),CME(LL),CHE(LL),RAT3(L
      1L),RAT1(LL),RAT2(LL),CHL,QCHEM(LL)
 1009 CONTINUE
  680 CONTINUE
       IF (IDENT-IBLANK) 1411,410,1411
 1411 PUNCH 498,TIMEO,MD,PE(IS,IT),H(NETA),GAM(L),CME(1),(ATA(K),ATB(K),
      1CMK(K),K=1 ,NSP)
  410 CONTINUE
  405 WALLQ=-WALLQ*C3
       RETURN                                                              B11A 306
       END                                                                 B11A 307
C0128                                                                      B128 001
       SUBROUTINE IMONS                                                    B128 002
       COMMON/COECOM/              C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15 B128   3
      1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C3A,CB128   4
      232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48B128   5
      3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,CB128   6
      465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,C81B128   7
      5,C82,C83,C84,C85,C86,C87,C88                                       B128   8
       COMMON/COECON/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8)     B128   9
      1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8)       B128  10
      2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8)    B128  11
      3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XM(5),XG(5),XSP(5, 9)   B128  12
      4,CKK3( 8, 8)                                                       B128  13
       COMMON/ERRCOM/FLE( 43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEM      B128  14
      1,SPLEM( 8),ELM(10),ELMM,IFLM,IGLM,ISPLM( 8),NELM,ILMM,DFL(43)      B128  15
      2,DGL(30),DSPL(30, 8),FNLE(10),GNLE(15),SPNLE(15, 9),ENL(153)       B128  16
      3,FNLEM,GNLEM,SPNLEM( 8),          ENLMM,IFNLM,IGNLM,ISPNLM( 8)     B128  17
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2611          4,NEWLM,INLMM,DFNL(18),DGNL(15),DSPNL(15, 8),DRNL(10)                    B128  18
2612           COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)            B128  19
2613          1,LAR(153),BA1(43,18),BA2(30,15)                                         B128  20
2614           COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8)B128  21
2615          1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HMUE,HFW,DLX2  B128  22
2616          2,C3M(40),BETAM(40)                                                      B128  23
2617           COMMON/INTCOM/ KR(20),KCM,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB128  24
2618          1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B128  25
2619          2,B(8),      MME,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B128  26
2620          3,KAUXO,JTIME,JSPEC,MO(3)                                                B128  27
2621           COMMON/NONCOM/AM(153,153),DVNL(153),TCM,                                B128  28
2622          1VLNKM,DLPH( 9),DLPK( 8, 9),DTHM,DTKM( 8),FLLXJB( 9)                     B128  29
2623           COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),M(15)         B128  30
2624          1,CPBAR(15),VMM(15),PHIK(15, 8),QRHOM,QRHOK( 8),ZK( 8),DZKM( 8),  DB128  31
2625          2MU3K( 8),QMU4K( 8),DTK( 8),DPHIKM( 8),CPRK( 8),DSCK( 8),DCAPCK( 8)B128  32
2626          3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)    B128  33
2627          4,DPHIKK( 8, 8),      DMU4M,DMU3M,DHTILM,VMU12,CT,CTR,CPTIL,HTIL     B128  34
2628          5,VMU3,DTH,DCAPCM,DPRM,DSCM,DQRM,DCPBM,DCPTM,DMU12M,VMU(15),  RHOP  B128  35
2629          6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15)     B128  36
2630           COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                          B128  37
2631     C     EVALUATE GROUPINGS WHICH CONTRIBUTE TO (I-1) PORTION OF COEFFS        B128 041
2632     C     VARIABLES WITH DIMENSION (NETA-1)                                     B128 042
2633      4000 CRHO(I-1)=C26*DETA(I-1)*(1.-C53/6.0*DETA(I-1))                        B128 044
2634           C63=C6*CRHO(I-1)                                                      B128 045
2635           IF (I-2) 4001,4002,4001                                               B128 052
2636      4002 XM(5)=0.                                                              B128 053
2637           XG(5)=0.                                                              B128 054
2638           IF (NSPM1) 401,401,4003                                               B128 055
2639      4003 DO 4004 K=1,NSPM1                                                     B128 056
2640      4004 XSP(5,K)=0.                                                           B128 057
2641      4001 CONTINUE
2642     C     EVALUATE XM,XG,AND XSP (WHICH CONTRIBUTE TO ERRORS AND TO COEFFS      B128 065
2643     C     AT (I) AND AT (I-1))                                                  B128 066
2644       401 CALL TAYLOR (DETA(I-1),F(2,I-1),F(2,I),XM)                          B128 067
2645           CALL TAYLOR (DETA(I-1),G(1,I-1),G(1,I),XG)                          B128 068
2646           IF(NSPM1)403,403,404                                                B128 069
2647       404 DO 414 K=1,NSPM1                                                    B128 070
2648       414 CALL TAYLOR (DETA(I-1),SP(1,I-1,K),SP(1,I,K),XSP(1,K))              B128 071
2649     C     EVAL PORTION OF NLE DEPENDENT ON XM,... AND GROUPINGS EVAL AT I-1   B128 072
2650       403 C72=F(2,I)*XM(1)     +F(3,I)*XM(2)     +F(4,I)*XM(3) +F(4,I-1)*XM(4)B128 073
2651           XM(5)=XM(5)+C72                                                     B128 074
2652           ENL(I+3)=-(-C33+C63/2.-C9*C72-2.*(F(2,I)*ZM(1,I-1)+F(3,I)*ZM(2
2653          1,I-1)+F(4,I)*ZM(3,I-1)+F(4,I-1)*ZM(4,I-1)))                         B128 076
2654           DUM1=F(2,I)*XG(1)+F(3,I)*XG(2)+F(4,I)*XG(3)+F(4,I-1)*XG(4)          B128 077
2655           XG(5)=XG(5)+DUM1                                                    B128 078
2656           MPI=MAT1J+I
2657           ENL(MPI)=-(-C84+C2*DUM1-(F(2,I)*ZG(1,I-1)+F(3,I)*ZG(2,I-1)+F(4,I)*
2658          1ZG(
2659          23,I-1)+F(4,I-1)*ZG(4,I-1))-(G(1,I)*ZM(1,I-1)+G(2,I)*ZM(2,I-1)+G(3,B128 081
2660          3I)*ZM(3,I-1)+G(3,I-1)*ZM(4,I-1)))                                   B128 082
2661           IF(NSPM1)405,405,406                                                B128 083
2662       406 DO 407 K=1,NSPM1
2663           MPI=MPI+MAT2J
2664           DUM1=F(2,I)*XSP(1,K)+F(3,I)*XSP(2,K)+F(4,I)*XSP(3,K)+F(4,I-1)* XSPB128 084
2665          1(4,K)                                                               B128 085
2666           XSP(5,K)=XSP(5,K)+DUM1                                              B128 086
2667           ENL(MPI)=-(-CKZZ(K)+C2*DUM1-(F(2,I)*ZSP(1,I-1,K)+F(
2668          23,I)*ZSP(2,I-1,K)+F(4,I)*ZSP(3,I-1,K)+F(4,I-1)*ZSP(4,I-1,K))-(SP(1B128 091
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2669          3,I,K)*ZM(1,I-1)+SP(2,I,K)*ZM(2,I-1)+SP(3,I,K)*ZM(3,I-1)+SP(3,I-1,KB128 092
2670          4)*ZM(4,I-1)))
2671        407 CONTINUE                                                          B128 093
2672      C     EVAL PORTION OF ORIG COEFFS OF AM DEPENDENT UPON PARAM EVAL AT I-1B128 096
2673      C**** ESTABLISH INDICES ON VARIABLES
2674        405 NUL=0
2675            IFN=I-2
2676            IFP=I+2
2677            IFPP=NETA+I-3
2678            IFPPP=IFPP+NETA
2679            ISPN=I
2680            ISPP=I-1
2681            ISPPP=IFPP+2
2682      C**** MOMENTUM EQUATION CORRECTION COEFFICIENTS
2683            AM(I+3,1)=-C81+C87*DETA(I-1)
2684            AM(I+3,IFP)=-C74+C86*DETA(I-1)
2685            IF(I-2) 410,410,415
2686        410 AM(I+3,2)=-C73
2687            AM(I+3,3)=-C12
2688            GO TO 420
2689        415 CALL LIAD(-1,I+3,IFN,-C73)
2690            CALL LIAD(-1,I+3,IFPP,-C12)
2691        420 CALL LIAD(-1,I+3, IFPPP,-2.*(C9 * XM(4)+ZM(4,I-1)))
2692            LPI=ISPN+MAT1J
2693            DO 450 K=NUL, NSPM1
2694            IF(K) 425,425,430
2695        425 DUM1=C88*DETA(I-1)-C75
2696            DUM2=0.
2697            GO TO 435
2698        430 DUM1=CK13(K)*DETA(I-1)-CK17(K)
2699            DUM2=0.
2700        435 AM(I+3,LPI)=DUM1
2701            IF(I-2) 440,440,445
2702        440 AM(I+3,LPI-1) = DUM2
2703            GO TO 450
2704        445 CALL LIAD(K,I+3, ISPP, DUM2)
2705        450 LPI=LPI+MAT2J
2706      C**** ENERGY AND SPECIES EQUATIONS
2707            MPJ=MAT1J+I
2708            DO 535 K=NUL, NSPM1
2709      C* *  ALF, F, FP, FPP, FPP ERROR DERIVITIVES ARE DUM1 TO DUM5. DUM6 TO
2710      C* *  DUM8 ARE FLUX DERIVITIVES FOR ALF, FP, FPP.
2711            IF(K) 455,455,460
2712      C- -  ENERGY EQUATIONS
2713        455 DUM1=-C82
2714            DUM2=-C76
2715            DUM3=-C77
2716            DUM4=-C78
2717            DUM6=C82
2718            DUM7=C77
2719            DUM8=C78
2720            GO TO 465
2721      C- -  SPECIES EQUATIONS
2722        460 DUM1=-(CK21(K)+2.*C56 *CK15(K))
2723            DUM2=-CK15(K)
2724            DUM3=-CK1*(K)+CK15(K)
2725            DUM4=-CK28(K)+C10*CK14(K)
2726            DUM6=CK21(K)
```

```
2727            DUM7=CK19(K)
2728            DUM8=CK20(K)
2729          465 DUM5=C2 *XSP(4,K)-ZSP(4,I-1,K)
2730            AM(MPJ,1)=DUM1
2731            AM(MPJ,IFP)= DUM3
2732            IF(I-2) 470,470,472
2733          470 AM(MPJ,2)=DUM2
2734            AM(MPJ,3)= DUM4
2735            AM(MPJ-1,1)= DUM6
2736            AM(MPJ-1, IFP)= DUM7
2737            AM(MPJ-1,3)= DUM9
2738            GO TO 475
2739          472 CALL LIAD(-1,MPJ,IFN,DUM2)
2740            CALL LIAD(-1, MPJ, IFPP, DUM4)
2741          475 CALL LIAD(-1,MPJ, IFPP, DUM5)
2742            LPI= ISPN+MAT1J
2743            DO 530 KK=NUL, NSPM1
2744       C * * DUM1/DUM4 AND DUM2/DUM5 ARE ERROR/FLUX DERIVATIVES WRT G OR SP AND
2745       C * * GP OR SPP, RESP.
2746            IF(K-KK) 480,480,485
2747       C - - ENERGY EQ. G VARIABLES
2748          480 DUM2=-C80
2749            DUM4=C43
2750            DUM5=C80
2751            GO TO 515
2752          485 IF(K) 490,490,495
2753       C - - ENERGY EQUATION, SP VARIABLES
2754          490 DUM1=-CK1(KK)
2755            DUM2=-CK2(KK)
2756            DUM4=-DUM1
2757            DUM5=-DUM2
2758            GO TO 508
2759          495 IF(KK) 500,500,505
2760       C - - SPECIES EQS., G VARIABLES
2761          500 DUM1=-CK9(K)
2762            DUM2=-CK5(K) + CK14(K)
2763            DUM4=CK9(K)
2764            DUM5=CK5(K)
2765            GO TO 508
2766       C - - SPECIES EQS., SP VARIABLES
2767          505 DUM1=-CKK2(K,KK)
2768            DUM2=-CKK1(K,KK)+B1(I-1)*CKK3(K,KK)
2769            DUM4=-DUM1
2770            DUM5=CKK1(K,KK)
2771            IF(K-KK) 508,515,508
2772          515 DUM1= -DUM4-C14
2773          508 AM(MPJ,LPI)=DUM1
2774            IF(I-2) 510,510,525
2775          510 AM(MPJ, LPI-1)= DUM2
2776          520 AM(MPJ-1, LPI) =DUM4
2777            AM(MPJ-1,LPI-1)=DUM5
2778            GO TO 530
2779          525 CALL LIAD(KK,MPJ, ISPP, DUM2)
2780          530 LPI=LPI+MAT2J
2781            CALL LIAD(K,MPJ,ISPPP,C2 *XM(4)-ZM(4,I-1))
2782          535 MPJ=MPJ+MAT2J
2783            RETURN
2784            END
```

```
2785      CB13B                                                                 B13B 001
2786            SUBROLTINE IONLY                                                B13B 002
2787            DIMENSION CK23( 8),CK24( 8),CK25( 8),CK26( 8)                   B13B 003
2788            COMMON/COECOM/              C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15B13B   4
2789           1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31,CB13B   5
2790           232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48B13B   6
2791           3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,CB13B   7
2792           465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,C81B13B   8
2793           5,C82,C83,C84,C85,C86,C87,C88                                    B13B   9
2794            COMMON/COECON/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8)  B13B  10
2795           1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8)    B13B  11
2796           2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8) B13B  12
2797           3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XM(5),XG(5),XSP(5, 9)B13B  13
2798           4,CKK3( 8, 8)                                                    B13B  14
2799            COMMON/ERRCOM/FLE( 43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEM   B13B  15
2800           1,SPLEM( 8),ELM(14),ELMM,IFLM,IGLM,ISPLM( 8),NELM,ILMM,DFL(43)   B13B  16
2801           2,DGL(30),DSPL(30, 8),FNLE(18),GNLE(15),SPNLE(15, 8),ENL(153)    B13B  17
2802           3,FNLEM,GNLEM,SPNLEM( 8),          FNLMM,IFNLM,IGNLM,ISPNLM( 8)  B13B  18
2803           4,NENLM,INLMM,DFNL(18),DGNL(15),DSPNL(15, 8),DRNL(10)            B13B  19
2804            COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)    B13B  20
2805           1,LAR(153),BA1(43,18),BA2(30,15)                                 B13B  21
2806            COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8B13B  22
2807           1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HHUE,HFW,DLX2 B13B  23
2808           2,C3M(40),BETAM(40)                                              B13B  24
2809            COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB13B  25
2810           1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, IYS,KAPPA,CBAR,CASE(15) B13B  26
2811           2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B13B  27
2812           3,KAUXO,JTIME,JSPEC,MD(3)                                        B13B  28
2813            COMMON/NONCOM/AM(153,153),DVNL(153),TCH,                        B13B  29
2814           1VLNKW,DLPH( 9),DLPK( 8, 9),DTHW,DTKW( 8),FLUXJB( 9)             B13B  30
2815            COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15) B13B  31
2816           1,CPBAR(15),VMW(15),PHIK(15, 8),DRHOH,DRHOK( 8),ZK( 8),DZKH( 8),  DB13B  32
2817           2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8)B13B  33
2818           3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)  B13B  34
2819           4,DPHIKK( 8, 8),      DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL  B13B  35
2820           5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15),  RHOP B13B  36
2821           6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15)  B13B  37
2822            DIMENSION CYM(3),CXM(3),CYSP(3)
2823      C     ADD CONTRIBUTIONS OF I TO NONLINEAR ERRORS                       B13B 038
2824      C     EVALUATE GROUPINGS WHICH ARE USED ONLY AT I (NOT AT I-1)         B13B 039
2825       4000 CRHO1= C26*DETA(I-1)*(1.+C53/6.0*DETA(I-1))                      B13B 041
2826            C89=C6*CRHO1                                                    B13B 042
2827            CRHO(I-1)=(CRHO(I-1)+CRHO1)/2.                                  B13B 043
2828            ENL(I+3)=ENL(I+3)-(C83+C89/2.)
2829            MPI=MAT1J+I
2830            ENL(MPI)=ENL(MPI)-C84
2831            IF(NSPM1)403,403,402                                            B13B 051
2832          402 DO 436 K=1,NSPM1                                              B13B 052
2833            MPI=MPI+MAT2J
2834            ENL(MPI) =ENL(MPI) -(CK22(K)-(PHIK(I,K)*DETA(I-1)-PHIKP(K)*B2(I-1)
2835           1-CK16(K)))
2836          436 CONTINUE
2837          404 DO 467 K=1,NSPM1                                              B13B 057
2838            CK23(K)=B2(I-1)*DPHIKH(K)                                       B13B 058
2839            CK24(K)=C13*CK23(K)                                             B13B 059
2840            CK25(K)=DETA(I-1)*DPHIKH(K)                                     B13B 060
2841          467 CK26(K)=C10*CK25(K)                                           B13B 061
2842      C     EVAL PORTION OF ORIG COEFFS OF AM DEPENDENT UPON PARAM EVAL AT I  B13B 062
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2843      C**** ESTABLISH INDICES FOR VARIABLES
2844        403 NUL=0
2845            IFN=I-1
2846            IFP=I+3
2847            IFPP=NETA+I-2
2848            IFPPP=IFPP+NETA
2849            ISPN=I+1
2850            ISPP=I
2851            ISPPP=IFPP+2
2852            DO 405 L=1,3
2853            CYM(L)=C2*XM(L)-ZM(L,I-1)
2854        405 CXM(L)=-(C9*XM(L) + ZM(L,I-1))*2.
2855      C**** MOMENTUM EQUATION
2856            AM(I+3,1)=AM(I+3,1)+C81-C5*C8*C72+C87*DETA(I-1)
2857            AM(I+3,IFP)=AM(I+3,IFP)+C74+C86*DETA(I-1)+CXM(1)
2858            CALL LIAD(-1,I+3,IFN,C73)
2859            CALL LIAD(-1,I+3,IFPP,C12+CXM(2))
2860            CALL LIAD(-1,I+3,IFPPP,CXM(3))
2861            LPI= ISPN+MAT1J
2862            DO 425 K=NUL, NSPM1
2863            IF(K) 410,410,415
2864        410 DUM1=C75+C88*DETA(I-1)
2865            DUM2=0.
2866            GO TO 416
2867        415 DUM1=CK13(K)*DETA(I-1)+CK17(K)
2868            DUM2=0.
2869        416 IF(I-NETA) 420,417,420
2870        417 CALL LIAD(K,I+3,1,DUM1)
2871            GO TO 421
2872        420 AM(I+3,LPI)=AM(I+3,LPI)+DUM1
2873        421 CALL LIAD (K,I+3,ISPP,DUM2)
2874        425 LPI=LPI+MAT2J
2875      C**** ENERGY AND SPECIES EQUATIONS
2876            MPJ=MAT1J+I
2877            DO 490 K=NUL, NSPM1
2878            DO 428 L=1,3
2879        428 CYSP(L)=C2*XSP(L,K)-ZSP(L,I-1,K)
2880      C * * ALF, F, FP, FPP, FPPP ERROR DERIVITIVES ARE DUM1 TO DUM5.
2881            IF(K) 430,430,435
2882      C - - ENERGY EQ.
2883        430 DUM1=C82
2884            DUM2=C76
2885            DUM3=C77+CYSP(1)
2886            DUM4=C78+CYSP(2)
2887            GO TO 440
2888      C - - SPECIES EQS.
2889        435 DUM1= CK21(K) +C56 *(CK26(K)-2. *CK24(K))
2890            DUM2=CK18(K)
2891            DUM3=CK19(K) + CK24(K)-CK26(K)+CYSP(1)
2892            DUM4=C10*(CK5(K)+CK23(K)) + CYSP(2)
2893        440 DUM5= CYSP(3)
2894            AM(MPJ,1)= AM(MPJ,1) + DUM1
2895            AM(MPJ, IFP)= AM(MPJ, IFP) + DUM3
2896            CALL LIAD(-1, MPJ, IFN,DUM2)
2897            CALL LIAD(-1, MPJ, IFPP, DUM4)
2898            CALL LIAD(-1, MPJ, IFPPP, DUM5)
2899            LPI= ISPN+MAT1J
2900            DO 485 KK=NUL,NSPM1
```

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2901      C * * DUM1 AND DUM2 ARE ERROR DERIVITIVES WRT G OR SP AND GP OR SPP
2902            IF(K+KK) 445,445,450
2903      C - - ENERGY EQ., G VARIABLES
2904        445 DUM1=C43
2905            DUM2=C80
2906            GO TO 475
2907        450 IF(K) 455,455,460
2908      C - - ENERGY EQ., SP VARIABLES
2909        455 DUM1=CK1(KK)
2910            DUM2=CK2(KK)
2911            GO TO 480
2912        460 IF(KK) 465,465,470
2913      C - - SPECIES EQS., G VARIABLES
2914        465 DUM1= CK9(K)-CK25(K)
2915            DUM2=CK5(K)+CK23(K)
2916            GO TO 480
2917      C - - SPECIES EQS., SPECIES VARIABLES
2918        470 DUM1=CKK2(K,KK)-DPHIKK(K,KK)*DETA(I-1)
2919            DUM2=CKK1(K,KK)+B2(I-1) * DPHIKK(K,KK)
2920            IF(K-KK) 480,475,480
2921        475 DUM1=DUM1+CYM(1)+C14
2922            DUM2=DUM2+CYM(2)
2923        480 IF(I-NETA) 483,482,483
2924        482 CALL LIAD(KK,MPJ,1,DUM1)
2925            GO TO 484
2926        483 AM(MPJ,LPI)=AM(MPJ,LPI)+DUM1
2927        484 CALL LIAD(KK,MPJ,ISPP,DUM2)
2928        485 LPI= LPI+MAT2J
2929            CALL LIAD(K,MPJ,ISPPP, CYM(3))
2930        490 MPJ=MPJ+MAT2J
2931            RETURN
2932            END                                                              B13B 307
2933      CB14A                                                                  B14A 001
2934            SUBROUTINE STATE
2935            COMMON/EDGCOM/            PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,B14A   3
2936           1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMWE,HE,C90   B14A   4
2937           2 ,DSIP(40),IDSIP,TTVC,TVCC(40)                                    B14A   5
2938            COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB14A   6
2939           1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B14A   7
2940           2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B14A   8
2941           3,KAUXO,JTIME,JSPEC,MD(3)                                          B14A   9
2942            COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) B14A  10
2943           1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO,  B14A  11
2944           2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                            B14A  12
2945            COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15)    B14A  13
2946           1,CPBAR(15),VMW(15),PHIK(15, 8),DRHOH,DRHOK( 8),ZK( 8),DZKH( 8),  DB14A  14
2947           2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8)B14A  15
2948           3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)   B14A  16
2949           4,DPHIKK( 8, 8),      DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL   B14A  17
2950           5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15),  RHOP B14A  18
2951           6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15)   B14A  19
2952            COMMON/STTCOM/GAM1,PRDUM,PRA,PRB,PRC,PRD,VMUA,VMUB,VMUC,VMUD,NC,   B14A  20
2953           1 FLD(6,3),VMWD                                                    B14A  21
2954            VMWE=VMWD
2955            KQ(6)=KQ(6)-1                                                      B14A 025
2956            KQ(7)=IABS(KR(18)*5)-4                                             B14A 026
2957            IF (KQ(5)-1 100,200,100
2958       100 TE(IS)=3000.
```

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2959            WRITE(KOUT,991)
2960            IHET=50
2961            IJK=3
2962            HE=GE(ITEM)
2963        110 HET=FLD(1,IJK)+FLD(2,IJK)+FLD(3,IJK)*(TE(IS)-5400.)+.5*FLD(4,IJK)*
2964           1(TE(IS)**2.-5400.**2.)-FLD(5,IJK)*(1./TE(IS)-1./5400.)
2965            CPT=FLD(3,IJK)+FLD(4,IJK)*TE(IS)+FLD(5,IJK)/TE(IS)**2.
2966            ERC=(HET-HE     )/CPT
2967            ITER=51-IHET
2968            ERC=SIGN(AMIN1(ABS(ERC),700.),ERC)
2969            TE(IS)=TE(IS)-ERC
2970            IF(TE(IS).LT.3600.) GO TO 120
2971            IF(TE(IS).GE.5400.) GO TO 125
2972            IJK=2
2973            GO TO 130
2974        120 IJK=1
2975            GO TO 130
2976        125 IJK=3
2977        130 CONTINUE
2978            IHET=IHET-1
2979            IF (IHET) 400,400,140
2980        140 IF (ABS(ERC)-.1)150,150,110
2981        150 SSTAG=FLD(6,IJK)+FLD(3,IJK)*ALOG(TE(IS)/5400.)+FLD(4,IJK)*(TE(IS)-
2982           15400.)-.5*FLD(5,IJK)*((1./TE(IS))**2.-(1./5400.)**2.)
2983            DO 155 II=1,NS
2984        155 TE(II)=TE(IS)
2985            VMACH=0.
2986        160 RHOE(IS)=PE(IS,IT)/TE(IS)*VMWE/0.7303
2987            UE(IS)=SQRT((GE(ITEM)-HE     )*50073.)
2988            VMUE(IS)=(VMUA*TE(IS)**VMUB)/(VMUC*TE(IS)+VMUD)
2989            GAM1=CPT/(CPT-1.9869/VMWE)
2990            IF (KQ(5).EQ.2) GO TO 165
2991            WRITE(KOUT,995)S(IS),TE(IS),CPT,PE(IS,IT),RHOE(IS),VMUE(IS),UE(IS)
2992           1,HE,SSTAGA,VMACH
2993            GO TO 166
2994        165 WRITE(KOUT,993)TE(IS),PE(IS,IT),UE(IS),VMACH,GAM1,HET,SSTAG,CPT,
2995           1RHOE(IS),VMUE(IS)
2996        166 KQ(6)=-1
2997        170 RETURN
2998        200 SSTAG=SSTAG-DSIP(IS)
2999            SSTAGA=SSTAG+1.9869/VMWE*ALOG(1./PTET(ITEM))
3000            DUM1=SSTAG+1.9869/VMWE*ALOG(PRE(IS))
3001            IST=50
3002        210 DS=-DUM1+FLD(6,IJK)+FLD(3,IJK)*ALOG(TE(IS)/5400.)+FLD(4,IJK)*(TE(I
3003           1S)-5400.)-.5*FLD(5,IJK)*((1./TE(IS))**2.-(1./5400.)**2.)
3004            CPT=FLD(3,IJK)+FLD(4,IJK)*TE(IS)+FLD(5,IJK)/TE(IS)**2.
3005            ERC=DS*TE(IS)/CPT
3006            ITER=51-IST
3007            ERC=SIGN(AMIN1(ABS(ERC),700.),ERC)
3008            TE(IS)=TE(IS)-ERC
3009            IF(TE(IS).LT.3600.) GO TO  212
3010            IF(TE(IS).GE.5400.) GO TO 214
3011            IJK=2
3012            GO TO 216
3013        212 IJK=1
3014            GO TO 216
3015        214 IJK=3
3016        216 CONTINUE
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3017            IST=IST-1
3018            IF (IST) 400,400,220
3019          220 IF (ABS(ERC)-.1)230,230,210
3020          230 HE=FLD(1,IJK)+FLD(2,IJK)+FLD(3,IJK)*(TE(IS)-5400.)+.5*FLD(4,IJK)*(
3021             1TE(IS)**2.-5400.**2.)-FLD(5,IJK)*(1./TE(IS)-1./5400.)
3022            VMACH=SQRT(2.*(GE(ITEM)-HE)*VMWE/GAM1/TE(IS)/1.9869)
3023            GO TO 160
3024          300 IHT=50
3025            IF (IS+ITEM-2)301,301,302
3026          301 T(I)=3000.
3027          302 HT=FLD(1,IJK)+FLD(2,IJK)+FLD(3,IJK)*(T(I)-5400.)+.5*FLD(4,IJK)*(T(
3028             1I)**2.-5400.**2.)-FLD(5,IJK)*(1./T(I)-1./5400.)
3029            CPBAR(I)=FLD(3,IJK)+FLD(4,IJK)*T(I)+FLD(5,IJK)/T(I)**2.
3030            ERC=(HT-H(I))/CPBAR(I)
3031            ERC=SIGN(AMIN1(ABS(ERC),700.),ERC)
3032            T(I)=T(I)-ERC
3033            IF(T(I).LT.3600.) GO TO 305
3034            IF(T(I).GE.5400.) GO TO 306
3035            IJK=2
3036            GO TO 307
3037          305 IJK=1
3038            GO TO 307
3039          306 IJK=3
3040          307 CONTINUE
3041            IHT=IHT-1
3042            IF(IHT)400,400,310
3043          310 IF(ABS(ERC)-.1)320,320,302
3044          320 CPTIL=CPBAR(I)
3045            DTH=1./CPBAR(I)
3046            DCPBH=DTH*(FLD(4,IJK)-2.*FLD(5,IJK)/T(I)**3.)
3047            DCPTH=DCPBH
3048            PR(I)=PRDUM+PRA*T(I)**PRB+PRC*T(I)**PRD
3049            DPRH=DTH*(PRA*PRB*T(I)**(PRB-1.)+PRC*PRD*T(I)**(PRD-1.))          B14A 048
3050            SC(I)=PR(I)                                                       B14A 049
3051            DSCH=DPRH                                                         B14A 050
3052            RHO(I)=RHOE(IS)/T(I)*TE(IS)
3053            DRHOH=-RHO(I)/T(I)*DTH                                            B14A 052
3054            VMU(I)=(VMUA*T(I)**VMUB)/(VMUC*T(I)+VMUD)
3055            VMW(I)=VMWE
3056            CAPC(I)=(T(I)/TE(IS))**(VMUB-1.)/(VMUC*T(I)+VMUD)*                B14A 053
3057           1(VMUC*TE(IS)+VMUD)                                                B14A 054
3058            DCAPCH=CAPC(I)*DTH*((VMUB-1.)/T(I)-VMUC/(VMUC*T(I)+VMUD))         B14A 055
3059            HTIL=H(I)                                                         B14A 056
3060            GMR(I)=CPBAR(I)/(CPBAR(I)-1.9869/VMWE)
3061            DHTILH=1.
3062            VMU12=VMWE                                                        B14A 058
3063            DMU12H=0.                                                         B14A 059
3064            VMU3=1./VMWE                                                      B14A 060
3065            DMU3H=0.                                                          B14A 061
3066            DMU4H=0.                                                          B14A 062
3067            QR(I)=0.                                                          B14A 063
3068            DQRH=0.                                                           B14A 064
3069            CT=0.                                                             B14A 065
3070            CTR=0.                                                            B14A 066
3071            RETURN                                                            B14A 067
3072          400 WRITE(KOUT,99)KQ(5)
3073           99 FORMAT(//40H***** STATE DOES NOT CONVERGE FOR KQ(5)=I2,6H *****//)
3074          991 FORMAT(1H1,10X19HSTAGNATION SOLUTION /12X15HEDGE CONDITIONS //)
```

```
      993 FORMAT(5X14HTEMPERATURE = E10.4,14H DEG R          //5X14HPRESSURE
         1   = E10.4,14H ATMOSPHERES   //5X14HVELOCITY    = E10.4,14H FT/SEC
         2         //5X14HMACH NUMBER = E10.4,//5X14HGAMMA       = E10.4,//5X
         314HENTHALPY    = E10.4,14H BTU/LB         //5X14HENTROPY      = E10.
         44,14H BTU/LB DEG R  //5X14HCP-FROZEN   = E10.4,14H BTU/LB DEG R  /
         5/5X14HDENSITY     = E10.4,14H LB/CU FT       //5X14HVISCOSITY   =
         6E10.4,14H LB/SEC FT     )
      995 FORMAT(3X10(2XE10.4))
          STOP
          END                                                                  B14A 068
     CB14B
          SUBROUTINE STATEN
          COMMON/STTCOM/GAM1,PRDUM,PRA,PRB,PRC,PRD,VMUA,VMUB,VMUC,VMUD,NC,    B14B   3
         1 FLD(6,3),VMWO                                                       B14B   4
          COMMON/INTCOM/ KR(20),KIN,XCUT
          DIMENSION TK(20,2),VMW(20),EF(6,20,3),ETMIN(20,3),ETMAX(20,3),
         1PVMW(20),PVOL(20),BTA(20),BTB(20),BTC(20),BTD(20),BTE(20)
       8000 READ (KIN,5) PRDUM,PRA,PRB,PRC,PRD
          READ (KIN,6)VMUA,VMUB,VMUC,VMUD
          READ (KIN,2) NC
          2 FORMAT(I3)
          DO 8105 JJ=1,NC
          READ(KIN,74)BTA(JJ),BTB(JJ),BTC(JJ),BTD(JJ),BTE(JJ),VMW(JJ),TK(JJ,
         11),IFRAC
          DO 8101 JK=1,2
       8101 READ(KIN,75)(EF(JI,JJ,JK),JI=1,6),ETMIN(JJ,JK),ETMAX(JJ,JK)
       8113 IF(ETMIN(JJ,2).LE.2500.) GO TO 8103
          DO 8102 JI=1,6
          EF(JI,JJ,3)=EF(JI,JJ,2)
       8102 EF(JI,JJ,2)=EF(JI,JJ,1)
          GO TO 8105
       8103 DO 8104 JI=1,6
       8104 EF(JI,JJ,3)=EF(JI,JJ,2)
       8105 CONTINUE
          IF (IFRAC.EQ.1) GO TO 8111
          DO 801 I=1,NC
        801 PVOL(I)=TK(I,1)/VMW(I)
          VVOL=0.
          DO 802 I=1,NC
        802 VVOL=VVOL+PVOL(I)
          DO 803 I=1,NC
        803 TK(I,2)=PVOL(I)/VVOL
          GO TO 8112
       8111 DO 804 I=1,NC
        804 TK(I,2)=TK(I,1)
       8112 DO 805 I=1,NC
        805 PVMW(I)=TK(I,2)*VMW(I)
          VMWE=0.
          DO 806 I=1,NC
        806 VMWE=VMWE+PVMW(I)
          VMWO=VMWE
          IF (IFRAC.EQ.2) GO TO 808
          DO 807 I=1,NC
        807 TK(I,1)=PVMW(I)/VMWE
        808 DO 8106 JI=1,6
          DO 8106 JJ=1,3
       8106 FLD(JI,JJ)=0.
          DO 8107 JK=1,3
```

```
      DO 8107 JJ=1,NC
      DO 8107 JI=1,6
 8107 FLD(JI,JK)=FLD(JI,JK)+EF(JI,JJ,JK)*TK(JJ,2)
      DO 8108 JK=1,3
      FLD(1,JK)=FLD(1,JK)*1.8/VMWE
      FLD(2,JK)=FLD(2,JK)*1.8/VMWE
      FLD(3,JK)=FLD(3,JK)/VMWE
      FLD(4,JK)=FLD(4,JK)/1.8/VMWE
      FLD(5,JK)=FLD(5,JK)*1.8*1.8/VMWE
 8108 FLD(6,JK)=FLD(6,JK)/VMWE
    1 FORMAT(6E9.6)
    5 FORMAT(5E10.4)
    6 FORMAT(4E10.4)
    7 FORMAT(/9X20HVISCOSITY LAW   MU=(E10.3,4H*T**E10.3,3H)/(E10.3,3H*T
     1+E10.3,1H)//9X19HPRANDTL NUMBER  PR=E10.3,1H+E10.3,4H*T**E10.3,1H+
     2E10.3,4H*T**E10.3,/)
   71 FORMAT(/9X34HTEMPERATURE LESS THAN 3600 DEG R.  /)
   72 FORMAT(/9X75HTEMPERATURE EQUAL TO OR GREATER THAN 3600 DEG R, BUT
     1LESS THAN 5400 DEG R.  /)
   73 FORMAT(/9X49HTEMPERATURE EQUAL TO OR GREATER THAN 5400 DEG R.  /)
   74 FORMAT(5A4,2E10.4 I2)
   75 FORMAT(6E9.6,2F6.1)
   77 FORMAT(/9X19HENTHALPY LAW      H=E10.3,1H+E10.3,1H+E10.3,11H*(T-540
     10.)+/40X3H.5*E10.3,17H*(T**2-5400.**2)-E10.3,16H*(1./T-1./5400.)//
     29X19HENTROPY LAW       S=E10.3,1H+E10.3,15H*ALOG(T/5400.)+E10.3,11H
     3*(T-5400.)-/40X3H.5*E10.3,22H*(1./T**2-1./5400.**2) /)
      WRITE(KOUT,7)VMUA,VMUB,VMUC,VMUD,PRDUM,PRA,PRB,PRC,PRD
      WRITE(KOUT,71)
      WRITE(KOUT,77) (FLD(JI,1),JI=1,6),(FLD(JJ,1),JJ=3,5)
      WRITE(KOUT,72)
      WRITE(KOUT,77) (FLD(JI,2),JI=1,6),(FLD(JJ,2),JJ=3,5)
      WRITE(KOUT,73)
      WRITE(KOUT,77) (FLD(JI,3),JI=1,6),(FLD(JJ,3),JJ=3,5)
      WRITE(KOUT,78)
      DO 1500 JJ=1,NC
 1500 WRITE(KOUT,79)BTA(JJ),BTB(JJ),BTC(JJ),BTD(JJ),BTE(JJ),TK(JJ,2),
     1TK(JJ,1)
   78 FORMAT(1H1/////21X13HFLUID MIXTURE ///11X9HCOMPONENT 10X4HMOLE
     18X4HMASS /28X9HFRACTION 4X8HFRACTION /)
   79 FORMAT(1H0,5X5A4,2(2XE10.4))
      WRITE(KOUT,80)VMWE
   80 FORMAT(//5X18HMOLECULAR WEIGHT = F12.7//)
      RETURN
      END                                                              8074 29
      SUBROUTINE RERAY(N,C,NO,D,NON,LS,IS,NO)
C     DIRECT INVERSION PROCEDURE -- C IS REPLACED BY C**-1
      DIMENSION D(NO,1),SD(153),C(NO,1),L(153),S(153),LL(153),LLL(153), 8158 003
     1LS(1)                                                            8158 004
      NNN=IABS(NON)
      NN = IABS(NO)
      KOUT=6
      N1 = N + 1                                                       RERA0070
      NP = N + NN                                                      RERA0080
      DO 15 I=1,NP                                                     RERA0090
      LLL(I) = I                                                       RERA0110
      IF (LS(1)) 10,10,5                                               RERA0120
    5 L(I) = LS(I)                                                     RERA0130
      GOTO 15                                                          RERA0140
```

```
3191          10 L(I) = I                                                                RERA0150
3192          15 CONTINUE                                                                RERA0160
3193             IX = - 1                                                                RERA0170
3194             IF (IS + 2) 45,35,45                                                    RERA0180
3195          20 FORMAT(11H  L(I),I=1,I3,5X (30I3))                                      RERA0190
3196          25 FORMAT(15H  ((C(I,J),J=1,I3,12H),(D(J),J=1,I3, 6H),I=1,I3,15H)  BERERA0200
3197            1FORE RERAY)                                                            RERA0210
3198          30 FORMAT(2X  11E10.3/(12X  10E10.3))                                      RERA0220
3199          35 WRITE(KOUT,25)NP,NNN,N                                                  RERA0230
3200             WRITE(KOUT,20)NP,(L(I),I=1,NP)                                          RERA0240
3201             IX = 0                                                                  RERA0250
3202             DO 40 I=1,N                                                             RERA0260
3203          40 WRITE(KOUT,30)(C(I,J),J=1,NP),(D(I,J),J=1,NNN)                          RERA0270
3204          45 IS = - 1                                                                RERA0280
3205       C     TRIANGULATE MATRIX                                                      RERA0290
3206             DO 130 I=1,N                                                            RERA0300
3207             DO 50 M=1,NP
3208          50 S(M)=ABS(C(I,M))                                                        RERA0330
3209             IF (IS) 55,60,60                                                        RERA0340
3210          55 IS = 0                                                                  RERA0350
3211             GOTO 90                                                                 RERA0360
3212       C     REDUCE ROW I BY PRECEEDING ROWS                                         RERA0370
3213          60 DO 85 J=2,I                                                             RERA0380
3214             K = L(J - 1)                                                            RERA0390
3215             DIV = - C(I,K)                                                          RERA0400
3216             IF (DIV) 65,85,65                                                       RERA0410
3217          65 C(I,K) = 0.                                                             RERA0420
3218             DO 70 M=1,NP                                                            RERA0430
3219             DIVC = DIV * C(J - 1,M)
3220             S(M)=AMAX1(S(M),ABS(DIVC))                                              RERA0450
3221          70 C(I,M) = C(I,M) + DIVC                                                  RERA0460
3222             IF (NNN) 85,85,75                                                       RERA0470
3223          75 DO 80 M=1,NNN                                                           RERA0480
3224          80 D(I,M) = D(I,M) + DIV * D(J - 1,M)                                      RERA0490
3225          85 CONTINUE                                                                RERA0500
3226       C     SEEK MAXIMUM PIVOT                                                      RERA0510
3227          90 DIV = 0.                                                                RERA0520
3228             DO 100 JJ=I,N                                                           RERA0530
3229             M = L(JJ)                                                               RERA0540
3230             IF (ABS(C(I,M)) - DIV) 100,100,95                                       RERA0550
3231          95 DIV = ABS(C(I,M))                                                       RERA0560
3232             K = M                                                                   RERA0570
3233             J = JJ                                                                  ENTR-NOD
3234             IF(I.LE.4) GO TO 100
3235             IF(ND-20)  100,100,101                                                  RERA0580
3236         100 CONTINUE
3237         101 SD(I)=DIV/S(K)
3238             L(J)=L(I)
3239             L(I)=K
3240             IF(SD(I)-1.E-9) 104,104,110
3241         104 C(I,K)=0.
3242             IF(SD(I)) 105,105,90
3243       C     SINGULAR MATRIX RETURN
3244         105 IS=-1
3245             WRITE(KOUT,135) (II,L(II),SD(II),II  ,I)
3246             RETURN                                                                  RERA0670
3247         110 DIV = C(I,K)                                                            RERA0680
3248             C(I,K) = 1.0
```

```
3240            K = LLL(J)                                                      RERA0690
3250            LLL(J) = LLL(I)                                                 RERA0700
3251            LLL(I) = K                                                      RERA0710
3252            LL(K) = I                                                       RERA0720
3253      C     NORMALIZE ROW                                                   RERA0730
3254            IF (NNN) 125,125,115                                            RERA0740
3255        115 DO 120 J=1,NNN                                                  RERA0750
3256        120 D(I,J) = D(I,J) / DIV                                           RERA0760
3257        125 DO 130 J=1,NP                                                   RERA0770
3258        130 C(I,J) = C(I,J) / DIV                                           RERA0780
3259            IF (IX) 145,140,145                                             RERA0790
3260        135 FORMAT(24H PIVOT ROW/COL/RES.RATIO 5(I4,1H/I3,1H/E9.2,1H,))     RERA0800
3261        140 WRITE(KOUT,135)(I,L(I),SO(I),I=1,NP)                            RERA0810
3262      C     DIAGONALIZE MATRIX                                              RERA0820
3263        145 NM = N - 1                                                      RERA0830
3264      C     INTERCHANGE COLUMNS                                             RERA0960
3265            DO 225 II=1,NP                                                  RERA0970
3266            I = II                                                          RERA0980
3267        180 J = L(I)                                                        RERA0990
3268            L(I) = I                                                        RERA1000
3269            IF (J - I) 185,225,135                                          RERA1010
3270        185 IF (IS) 200,190,200                                             RERA1020
3271        190 DO 195 M=1,N                                                    RERA1030
3272            S(M) = C(M,I)                                                   RERA1040
3273        195 C(M,I) = C(M,J)                                                 RERA1050
3274            IS = I                                                          RERA1060
3275            I = J                                                           RERA1070
3276            GOTO 180                                                        RERA1080
3277        200 IF (IS - J) 205,215,205                                         RERA1090
3278        205 DO 210 M=1,N                                                    RERA1100
3279        210 C(M,I) = C(M,J)                                                 RERA1110
3280            I = J                                                           RERA1120
3281            GOTO 180                                                        RERA1130
3282        215 DO 220 M=1,N                                                    RERA1140
3283        220 C(M,I) = S(M)                                                   RERA1150
3284            IS = 0                                                          RERA1160
3285        225 CONTINUE                                                        RERA1170
3286            IF(NQN + NQ) 149,149,144
3287        144 IF(NQN+NQ-NN-NNN) 149,147,149
3288      C*****SOLUTION VECTOR ONLY
3289        147 K=N
3290            DO 153 I=1,NN
3291            K=K-1
3292            DO 153 IL=K,NN
3293            DUM=C(K,IL+1)
3294            IF (NN) 152,152,151
3295        151 DO 146 M=N1,NP
3296        146 C(K,M) = C(K,M) - DUM * C(IL+1,M)
3297            C(K,1)=C(K,1)-DUM*C(IL+1,1)
3298            IF (NNN) 153,153,152
3299        152 DO 148 M=1,NNN
3300        148 D(K,M)=D(K,M)-DUM*D(IL+1,M)
3301        153 CONTINUE
3302            GO TO 176
3303      C*****FULL INVERSION AND SOLUTION VECTOR
3304        149 DO 175 I=1,NN                                                   RERA3440
3305            DO 175 J=1,I                                                    RERA3450
3306            DIV = - C(J,I+1)
```

```
3307          IF (DIV) 150,175,150                                              RERA0880
3308        150 C(J,I+1) = 0.
3309          IF (NNN) 165,165,155                                              RERA0900
3310        155 DO 161 M=1,NNN                                                  RERA0910
3311        160 D(J,M) = D(J,M) + DIV * D(I + 1,M)                              RERA0920
3312        165 DO 170 M=1,NP                                                   RERA0930
3313        170 C(J,M) = C(J,M) + DIV * C(I + 1,M)                              RERA0940
3314        175 CONTINUE                                                        RERA0950
3315      C     INTERCHANGE ROWS                                                RERA1180
3316        176 DO 320 II=1,N                                                   RERA1190
3317          I = II                                                            RERA1200
3318        230 J = LL(I)                                                       RERA1210
3319          LL(I) = I                                                         RERA1220
3320          IF (J - I) 235,320,235                                            RERA1230
3321        235 IF (IS) 265,240,265                                             RERA1240
3322        240 DO 245 M=1,NP                                                   RERA1250
3323          S(M) = C(I,M)                                                     RERA1260
3324        245 C(I,M) = C(J,M)                                                 RERA1270
3325          IF (NNN) 260,260,250                                              RERA1280
3326        250 DO 255 M=1,NNN                                                  RERA1290
3327          SD(M) = D(I,M)                                                    RERA1300
3328        255 D(I,M) = D(J,M)                                                 RERA1310
3329        260 IS = I                                                          RERA1320
3330          I = J                                                             RERA1330
3331          GOTO 230                                                          RERA1340
3332        265 IF (IS - J) 270,295,270                                         RERA1350
3333        270 DO 275 M=1,NP                                                   RERA1360
3334        275 C(I,M) = C(J,M)                                                 RERA1370
3335          IF (NNN) 240,290,280                                              RERA1380
3336        280 DO 285 M=1,NNN                                                  RERA1390
3337        285 D(I,M) = D(J,M)                                                 RERA1400
3338        290 I = J                                                           RERA1410
3339          GOTO 230                                                          RERA1420
3340        295 DO 300 M=1,NP                                                   RERA1430
3341        300 C(I,M) = S(M)                                                   RERA1440
3342          IF (NNN) 315,315,305                                              RERA1450
3343        305 DO 310 M=1,NNN                                                  RERA1460
3344        310 D(I,M) = SD(M)                                                  RERA1470
3345        315 IS = 0                                                          RERA1480
3346        320 CONTINUE                                                        RERA1490
3347          IF (IX) 340,330,340                                               RERA1500
3348        325 FORMAT(15H  ((C(I,J),J=1,I3,12H),(D(J),J=1,I3, 6H),I=1,I3,15H)  AFRERA1510
3349           1YER RERAY  )                                                    RERA1520
3350        330 WRITE(KOUT,325)NP,NNN,N                                         RERA1530
3351          DO 335 I=1,N                                                      RERA1540
3352        335 WRITE(KOUT,30) (C(I,J),J=1,NP),(D(I,J),J=1,NNN)                 RERA1550
3353        340 RETURN                                                          RERA1560
3354          END
3355      CB16A                                                               B16A  001
3356          SUBROUTINE SLOPQ(N,X,Y,S,Z)                                     B16A  002
3357          DIMENSION X(1),Y(1),S(1),Z(1)                                   B16A  003
3358          IF(N-1) 9,9,8                                                   B16A  004
3359        8 S(2)=(Y(2)-Y(1))/(X(2)-X(1))                                    B16A  005
3360          S(1)=S(2)                                                       B16A  006
3361          QC=S(2)                                                         B16A  007
3362          DO 7 I=1,N                                                      B16A  008
3363          IF(I+1-N)2,1,6                                                  B16A  009
3364        1 QB=QC                                                           B16A  010
```

```
3365            IF (I-2)7,6,5                                                   B16A 011
3366          2 XOT=X(I)-X(I+1)                                                 B16A 012
3367            XTT=X(I+1)-X(I+2)                                               B16A 013
3368            XTO=X(I+2)-X(I)                                                 B16A 014
3369            AA=Y(I)/(XOT*XTO)                                               B16A 015
3370            XOTT=XOT*XTT                                                    B16A 016
3371            AB=Y(I+1)/XOTT                                                  B16A 017
3372            AC=Y(I+2)/(XTT*XTO)                                             B16A 018
3373            AAA=AA*XTT                                                      B16A 019
3374            ABB=AB*XTO                                                      B16A 020
3375            ACC=AC*XOT                                                      B16A 021
3376            QA=QC                                                           B16A 022
3377            QB=S(I)                                                         B16A 023
3378            QC=S(I+1)                                                       B16A 024
3379            S(I)=AA*(XTO-XOT)+ABB-ACC                                       B16A 025
3380            S(I+1)=AB*(XOT-XTT)+ACC-AAA                                     B16A 026
3381            S(I+2)=AC*(XTT-XTO)+AAA-ABB                                     B16A 027
3382          3 IF(I-2)7,5,4                                                    B16A 028
3383          4 S(I)=(S(I)+QA)/2.                                               B16A 029
3384          5 S(I)=(S(I)+QB)/2.                                               B16A 030
3385          6 XD=X(I)-X(I-1)                                                  B16A 031
3386            YS=Y(I)+Y(I-1)                                                  B16A 032
3387            SD=S(I)-S(I-1)                                                  B16A 033
3388            SS=S(I)                                                         B16A 034
3389            Z(I)=Z(I-1)+XD/2.*(YS-XD/6.*SD)                                 B16A 035
3390            S(I)=SS                                                         B16A 036
3391          7 CONTINUE                                                        B16A 037
3392          9 RETURN                                                          B16A 038
3393            END                                                             B16A 039
3394    CB17A                                                                   B17A 001
3395            SUBROUTINE ABMAX(N,X,XM,I)                                      B17A 002
3396            DIMENSION X(1)                                                  B17A 003
3397            I=1                                                             B17A 004
3398            XM=ABS (X(1))                                                   B17A 005
3399            IF (N-1) 4,4,5                                                  B17A 006
3400          5 DO 3 J=2,N                                                      B17A 007
3401            XT=ABS (X(J))                                                   B17A 008
3402            IF(XM-XT) 2,3,3                                                 B17A 009
3403          2 XM=XT                                                           B17A 010
3404            I=J                                                             B17A 011
3405          3 CONTINUE                                                        B17A 012
3406          4 XM=X(I)                                                         B17A 013
3407            RETURN                                                          B17A 014
3408            END                                                             B17A 015
3409    CB18A                                                                   B18A 001
3410            SUBROUTINE MATS1(X)
3411            COMMON/INTCOM/KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA
3412            COMMON/ETACOM/ETA(15),DETA(15)                                  B18A 004
3413            DIMENSION X(1),A(14),B(14),C(14)                                B18A 005
3414            IF(KR(1).LT.-50) GO TO 16
3415            JB=NETA
3416            IF(KR(10)-1) 11,18,19
3417         16 KR(1)=KR(1)+100
3418            JB=2
3419            X(NETA)=X(NETA)+X(1)
3420            IF(KR(10)-1) 11,18,19
3421         18 LIM=NETA-2
3422            GO TO 20
```

```
3423          19 LIM=NETA-1
3424          20 J=JB
3425             K=JB+NETA-1
3426             XJ=0.
3427             DO 25 I=1,LIM
3428             XK=(X(J)/DETA(I)-XJ)*2.
3429             X(J)=-X(K)+XK
3430             X(K)=XK/DETA(I)
3431             IF(JB-2) 21,23,21
3432          23 IF(I+1-NETA) 24,27,27
3433          21 X(I)=(XJ/2.+XK/6.)*DETA(I)*DETA(I)-X(I)
3434             IF(I+1-NETA) 22,27,27
3435          22 X(I+1)=X(I+1)-X(I)
3436          24 XJ=X(J)
3437             X(K+1)=X(K+1)-XJ
3438             J=J+1
3439          25 K=K+1
3440             I=NETA-1
3441             XK=(3.*(X(J)/DETA(I)-XJ)-X(K)-X(K+1))*2.
3442             XKP=X(K)*2.-XK
3443             X(J)=X(K+1)
3444             X(K+1)=XKP/DETA(I)
3445             X(K)=XK/DETA(I)
3446             IF(JB-2) 26,27,26
3447          26 X(I)=(XJ/2.+XK/8.+XKP/24.)*DETA(I)*DETA(I)-X(I)
3448          27 RETURN
3449          11 DSV=DETA(NETA)
3450             DETA(NETA)=0.
3451           1 B(1)=.5
3452             A(1)=DETA(1)/4.+DETA(2)/2.
3453             DO 2 I=3,NETA
3454             C(I-2)=DETA(I-1)/(6.*A(I-2))
3455             B(I-1)=.5-C(I-2)*B(I-2)
3456           2 A(I-1)=(1./3.-C(I-2)*B(I-2))*DETA(I-1)+B(I-1)*DETA(I
3457          12 J=NETA-1
3458             K=J+JB-1
3459             L=K+J
3460             X(L)=X(L)+X(L+1)
3461           3 X(L-1)=X(L-1)+X(L)
3462             X(L)=X(L)-X(K)/DETA(J)
3463             L=L-1
3464             K=K-1
3465             J=J-1
3466             IF (J-1) 4,4,3
3467           4 X(L)=X(L)-X(K)/DETA(1)*1.5
3468             J=L
3469             DO 5 I=3,NETA
3470             X(J+1)=X(J+1)-C(I-2)*X(J)
3471           5 J=J+1
3472             XS=X(J+1)
3473             I=NETA-1
3474             GO TO 8
3475           6 M=L
3476             DUM=X(J+1)*(DETA(I+1)+DETA(I+2))
3477             DO 7 K=1,I
3478             X(M)=X(M)-DUM*B(K)
3479           7 M=M+1
3480              J=J-1
```

```
3481          8 X(J+1)=X(J)/A(I)
3482            I=I-1
3483            IF (I) 9,9,6
3484          9 DUM=DETA(1)*DETA(1)
3485            X(J)=X(JB)/DUM*3.-.5*X(J+1)
3486            IF(JB-2) 13,14,13
3487         13 X(1)=DUM*DETA(1)*(X(J)/8.+X(J+1)/24.)-X(1)
3488         14 L=JB
3489            DO 10 I=3,NETA
3490            J=J+1
3491            X(L)=X(L+1)/DETA(I-1)-DETA(I-1)/3.*(X(J)+.5*X(J+1))
3492            IF(JB-2) 15,10,15
3493         15 DUM=DETA(I-1)*DETA(I-1)
3494            X(I-1)=X(I-2)-X(I-1)+DUM*(X(L)/2.+DETA(I-1)*(X(J)/8.+X(J+1)/24.))
3495         10 L=L+1
3496            X(L)=XS
3497            DETA(NETA)=DSV
3498            RETURN
3499            END
3500      CB18B
3501            SUBROUTINE MATS2(X)
3502            COMMON /INTCOM/ KR(20)
3503            KR(1)=KR(1)-100
3504            CALL MATS1(X)
3505            RETURN
3506            END
3507      CB19A
3508            SUBROUTINE TRMBL(ILK)
3509            DIMENSION EPSOUT(379)                                          B19A 003
3510            DIMENSION XP(4)                                                ENTR-MOD
3511            COMMON/COECOM/              C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15B19A   4
3512           1,C16,C17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31,CB19A   5
3513           232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48B19A   6
3514           3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,CB19A   7
3515           465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,C81B19A   8
3516           5,C82,C83,C84,C85,C86,C87,C88                                  B19A   9
3517            COMMON/COECON/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8)    B19A  10
3518           1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8)      B19A  11
3519           2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8)   B19A  12
3520           3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XM(5),XG(5),XSP(5, 9)  B19A  13
3521           4,CKK3( 8, 8)                                                  B19A  14
3522            COMMON/EDGCOM/            PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,B19A  15
3523           1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMWE,CGE,C90  ENTR-MOD
3524           2,DSIP(40),IDSIP,TTVC,TVCC(40),HEA(40), SF(20),CS(20),CSPR(20),     ENTR-MOD
3525           3CG(20),CGP(20),SREF,GEP,NEN,UINF,RHOINF,HINF,PINF                 ENTR-MOD
3526            COMMON/EPSCOM/ELCON,YAP,CLNUM,SCT,PRT,RED,DVS,RHOVS,PI,PIM,CL,     B19A  18
3527           1 EPSA(15),EPS1,EL(15),DPI(15,2),DEPC,TREF,RETR,VINTR(15)          ENTR-MOD
3528            COMMON/ERRCOM/FLE( 43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEM      B19A  20
3529           1,SPLEM( 8),ELM(14),ELMM,IFLM,IGLM,ISPLM( 8),NELM,ILMM,DFL(43)     B19A  21
3530           2,DGL(30),DSPL(30, 8),FNLE(18),GNLE(15),SPNLE(15, 8),ENL(153)      B19A  22
3531           3,FNLEM,GNLEM,SPNLEM( 8),          ENLMM,IFNLM,IGNLM,ISPNLM( 8)    B19A  23
3532           4,NENLM,INLMM,DFNL(18),DGNL(15),DSPNL(15, 8),DRNL(10)              B19A  24
3533            COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)      B19A  25
3534           1,LAR(153),BA1(43,18),BA2(30,15)                                   B19A  26
3535            COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8)B19A  27
3536           1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HHUE,HFW,DLX2  B19A  28
3537           2,C3M(40),BETAM(40)                                                B19A  29
3538            COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB19A  30
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3539          1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B19A  31
3540          2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B19A  32
3541          3,KAUXO,JTIME,JSPEC,MD(3)                                          B19A  33
3542           COMMON/NONCOM/AM(153,153),DVNL(153),TCH,                          B19A  34
3543          1VLNKH,DLPH( 9),DLPK( 8, 9),DTHH,DTKH( 8),FLUXJB( 9)              B19A  35
3544           COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15)   B19A  36
3545          1,CPBAR(15),VMW(15),PHIK(15, 8),DRHOH,DRHOK( 8),ZK( 8),DZKH( 8),  DB19A  37
3546          2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8)B19A  38
3547          3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)   B19A  39
3548          4,DPHIKK( 8, 8),      DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL   B19A  40
3549          5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15),  RHOP B19A  41
3550          6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15)   B19A  42
3551           COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                    B19A  43
3552           EQUIVALENCE(EPSOUT(1),ELCON)
3553           GO TO (1001,1002,1003,1004,1005),ILK
3554       1001 CONTINUE
3555          1 FORMAT(8E10.3)
3556          2 FORMAT(/30H      MIXING LENGTH CONSTANT  =1PE11.4
3557           1        /30H      SUBLAYER CONSTANT, YA+  =1PE11.4
3558           2        /30H      CLAUSER NUMBER          =1PE11.4
3559           3        /30H      TURBULENT SCHMIDT NUMBER=1PE11.4
3560           4        /30H      TURBULENT PRANDTL NUMBER=1PE11.4
3561           5        /30H      TRANSITION MOM.THICK.RE =1PE11.4//)
3562           READ(KIN,1)  ELCON,YAP,CLNUM,SCT,PRT,RETR
3563           WRITE(KOUT,2)ELCON,YAP,CLNUM,SCT,PRT,RETR
3564           KQ(10)=1
3565           KR(7)=KR(7)-2
3566           IF(RETR.GT.0.) KQ(10)=-1
3567           IF(RETR.LT.-1.999) KQ(10)=-10.01+RETR                             ENTR-MOD
3568           CONE=NETA-KAPPA                                                   ENTR-MOD
3569           RNOSE=FLOAT(KAPPA)                                                ENTR-MOD
3570           DO 13 I=1,NETA                                                    ENTR-MOD
3571           IF(I.LT.KAPPA.OR.YAP.GE.0.) GO TO 12                              ENTR-MOD
3572           VINTR(I)=1.-(FLOAT(I)-RNOSE)/CONE                                 ENTR-MOD
3573           GO TO 13                                                          ENTR-MOD
3574          12 VINTR(I)=1.                                                     ENTR-MOD
3575          13 CONTINUE                                                        ENTR-MOD
3576           YAP=ABS(YAP)                                                      ENTR-MOD
3577           RETURN
3578       1002 CONTINUE
3579       C**** CALCULATES EPS2/NUE AND ITS DERIVITIVES AS DVS AND AM(1,...)
3580           NUL=0
3581       COMMENT  ..  C3=-DEL/VMUE  , RHOVS=-DEL/VMUE*RHOV=-RED*RHOV/(RHOE*UE)
3582           RED=-C3 *RHOE(IS) *UE(IS)
3583           RC=RED*CLNUM
3584           P1=0.
3585           EPS1=0.
3586           DEPC=0.
3587           RHOVS=C1*F(1,1)+HF(1,5)
3588           IF(RC)75,4,4                                                      ENTR-MOD
3589          4 RR=RHOE(IS)/RHO(1)                                               ENTR-MOD
3590           RRP=RR/RHO(1)*RHOP(1)
3591           YDI=0.
3592           QI=0.
3593           SDY=0.
3594           YDIQ=0.
3595           DVS=0.
3596           DO 66 I=1,NETA
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```
3597            RRPD=-RRP
3598            RI=RR
3599            YDS=YDI
3600            QS=QI
3601            YDQD=-YDIQ
3602            IF(I-NETA) 5,15,15
3603          5 RR=RHOE(IS)/RHO(I+1)
3604            RRP=RR/RHO(I+1)*RHOP(I+1)
3605            RRFD=F(3,I)/RI-F(3,I+1)/RR
3606            RRPD=RRPD+RRP
3607            YDI=DETA(I)/2.*(RR+RI+DETA(I)/6.*RRPD)
3608            SDY=SDY+YDI
3609            DUM1=YDI/6.*RRFD
3610            DUM2=F(2,NETA)-(F(2,I)+F(2,I+1))*0.5
3611            DVS=DVS+YDI*(DUM2-DUM1/2.)
3612            YDIQ=YDI*YDI
3613            YDQD=YDQD+YDIQ
3614            QI=DETA(I)/2.*(DUM2-DUM1)
3615            QS=QS+QI
3616            YDS=YDS+YDI
3617         15 DRHOI=-QS*RI/RHO(I)-F(3,I)/12.*YDQD/RHOE(IS)
3618            LR=MAT1J+I                                                    B19A
3619            DUM=AM(LR,124)* DRHOI* RC                                     B19A
3620            AM(1,I+3)=AM(1,I+3)-0.5*RC*YDS+C7*DUM*F(2,I)
3621            IF(I-1) 20,20,25
3622         20 AM(1,3)=AM(1,3)-RC/RI*YDQD/12.
3623            GO TO 30
3624         25 CALL LIAD(-1,1,NETA-2+I,-RC/RI*YDQD/12.)
3625         30 AM(1,1)=AM(1,1)-DUM*C7*F(2,I)*F(2,I)/ALPH
3626            MPJ=MAT1J+1+I
3627            DO 60 K=NUL, NSPM1
3628            IF(K) 40,40,35
3629         35 LRK=MAT1J+MAT2J+I
3630            DUM=AM(LR,K+124)* DRHOI* RC                                   B19A
3631         40 IF(I-NETA) 50,55,50
3632         50 AM(1,MPJ)=AM(1,MPJ)+DUM
3633            GO TO 60
3634         55 CALL LIAD(K,1,1,DUM)
3635         60 MPJ=MPJ+MAT2J
3636            IF(KR(17)) 66,66,65
3637         65 WRITE (KOUT,640) RC,RR,SDY,RRP,RRPD,RRFD,YDI,YDS,DUM1,DUM2,DVS
3638           1,YDIQ,YDQD,QI,QS,DRHOI,AM(LR,104),(AM(LRK,K+107),K=1,NSPM1),
3639           2(AM(1,J), J=1,NNLEQ), ENL(1)
3640         66 CONTINUE
3641            DVS=AMAX1(0.,RC*DVS)
3642            AM(1,MAT1J)=AM(1,MAT1J)+SDY*RC
3643            RETURN
3644         75 RC=-R(                                                        ENTR-MOD
3645            DVS=0.                                                        ENTR-MOD
3646            DO 80 I=2,NETA                                                ENTR-MOD
3647            CALL TAYLOR(DETA(I-1),F(2,I-1),F(2,I),XP)                     ENTR-MOD
3648            DVS=DVS+(F(2,I)*XP(1)+F(3,I)*XP(2)+F(4,I)*XP(3)+F(4,I-1)*XP(4)) ENTR-MOD
3649            IFP=I+3                                                       ENTR-MOD
3650            IFPP=NETA+I-2                                                 ENTR-MOD
3651            IFPPP=IFPP+NETA                                               ENTR-MOD
3652            AM(1,IFP)=XP(1)+AM(1,IFP)                                     ENTR-MOD
3653            CALL LIAD(-1,1,IFPP,XP(2))                                    ENTR-MOD
3654            CALL LIAD(-1,1,IFPPP,XP(3))                                   ENTR-MOD
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3655          CALL LIAD(-1,1,IFPPP-1,XP(4))                                  ENTR-MOD
3656       80 CONTINUE                                                       ENTR-MOD
3657          DVS=DVS*RC/F(2,NETA)                                           ENTR-MOD
3658          DO 85 I=1,NNLEQ                                                ENTR-MOD
3659       85 AM(1,I)=-AM(1,I)*RC*2./F(2,NETA)                               ENTR-MOD
3660          AM(1,2)=AM(1,2)-RC                                             ENTR-MOD
3661          AM(1,MAT1J)=AM(1,MAT1J)+DVS/F(2,NETA)                          ENTR-MOD
3662          CALL LIAD(-1,1,NETA-1,RC)                                      ENTR-MOD
3663          DVS=AMAX1(RC*(F(1,NETA)-F(1,1))-DVS,0.)                        ENTR-MOD
3664          RETURN                                                         ENTR-MOD
3665     1003 CONTINUE
3666     C**** CALCULATES MIXING LENGTH AND ITS DERIVITIVES
3667      100 PIM=PI
3668          PI=SQRT(ABS(RED/C26*(CAPC(1)*F(3,1)-ALPH*RHOVS*F(2,I))))/
3669         1    (CAPC(I)*YAP)
3670          IF(I-1) 305,305,101
3671      101 EPI=EXP(-(PI+PIM)/2.*DETA(I-1))
3672          PID=PI-PIM
3673          IF(PID/PI-.0001) 102,102,103
3674      102 PI=AMAX1(PI,PIM)
3675          PID=1.0
3676          AF=1.0
3677          ERP1=1./PI
3678          ERPP1=-2./(PI*PI)
3679          ERP2=1./PIM
3680          ERPP2=-2./(PIM*PIM)
3681          GO TO 104
3682      103 AF=SQRT(2./PID*DETA(I-1))
3683          ERP1=ERP(AF/2.*PI)
3684          ERPP1=1.-AF*PI*ERP1
3685          ERP2=ERP(AF/2.*PIM)
3686          ERPP2=1.-AF*PIM*ERP2
3687      104 BF=ERP1-EPI*ERP2
3688          DCLL=EPI
3689          DUM1=DETA(I-1)/2.*EPI*(AF*ERP2-CL)
3690          CL=CL*EPI+AF*BF
3691          EL(I)=ALPH*ELCON*(ETA(I)-CL)
3692          DUM2=AF/PID*(BF/2.+ERPP1/4.*AF*PI-EPI*ERPP2/4.*AF*PIM)
3693          DUM3=AF/2.*AF
3694          DCLPI=DUM1-DUM2+DUM3*ERPP1
3695          DCLPM=DUM1+DUM2-DUM3*ERPP2*EPI
3696          IF(I-2) 305,330,320
3697      305 EL(1)=0.
3698          DO 307 J=1,NNLEQ
3699      307 AM(2,J)=0.                                                     ENTR-MOD
3700          CL=0.
3701          DPI(1,2)= CAPC(1)
3702          DPI(3,1)= F(3,1)*DCAPCH
3703          IF(NSPM1) 350,350,310
3704      310 DO 315 K=1,NSPM1
3705      315 DPI(K+3,1)= F(3,1) * DCAPCH(K)
3706          GO TO 350
3707      320 DO 325 J=1,NNLEQ
3708      325 AM(2,J)=AM(2,J)*DCLL                                           ENTR-MOD
3709      330 DUM=-TREF*DCLPM*ELCON*ALPH
3710          AM(2,1)=AM(2,1)+(EL(I)-DCLL*EL(I-1))/ALPH                      ENTR-MOD
3711          L=I-1
3712      331 AM(2,1)=AM(2,1)+DPI(1,L)*DUM                                   ENTR-MOD
```

```
3713            AM(2,2)=AM(2,2)+DPI(2,1)*DUM
3714            AM(2,3)=AM(2,3)+DPI(1,2)*DUM                                    ENTR-MOD
3715            AM(2,L+3)=AM(2,L+3)+DPI(2,2)*DUM                                ENTR-MOD
3716            J=MAT1J+2                                                       ENTR-MOD
3717            DO 340 K=NUL,NSPM1
3718            AM(2,J)=AM(2,J)+DPI(K+3,1)*DUM
3719            JL=J+L-1                                                        ENTR-MOD
3720            AM(2,JL)=AM(2,JL)+DPI(K+3,2)*DUM
3721     340    J=J+MAT2J                                                       ENTR-MOD
3722     345    IF(L-I) 350,400,400
3723     350    TREF= RED/C26 /(2.*CAPC(I)*YAP*PI*YAP*CAPC(I))
3724            DPI(3,2)=-PI/TREF*(DCAPCH/CAPC(I)-DRHOH/(2.*RHO(I)))
3725            DPI(2,2)= C10*DPI(3,2)-RHOVS*ALPH
3726            DPI(1,1)=-C56*C10*DPI(3,2)-RHOVS*F(2,I)
3727            DPI(2,1)=-ALPH*C1*F(2,I)
3728            IF(NSPM1) 362,362,355
3729     355    DO 360 K=1,NSPM1
3730     360    DPI(K+3,2)=-PI/TREF*(DCAPCK(K)/CAPC(I)-DRHOK(K)/(2.*RHO(I)))
3731     362    L=I
3732            DUM=-TREF*DCLPI*ELCON*ALPH
3733            IF(I-1) 445,445,365
3734     365    IF(I-NETA) 331,400,400
3735     C**** CALCULATES EPS1 AND EPS2 -- COMPARES TO GET EPS -- CALCULATES EPS
3736     C                                                                      DERIVITIVES
3737      400   DUM1=EL(I)/ALPH*EL(I)/ALPH*RED/C26
3738            C26S=C26*C26
3739            EPS1=AMAX1(DUM1*F(3,I),EPS1)
3740            EPS2=DVS/C26S
3741            IF(EPS1-EPS2) 405,401,401
3742      401   EPS=EPS2*VINTR(I)
3743            ENL(3)=ENL(1)/C26S*VINTR(I)                                     ENTR-MOD
3744            DO 402 J=1,NNLEQ                                                ENTR-MOD
3745      402   AM(3,J)=AM(1,J)/C26S*VINTR(I)                                   ENTR-MOD
3746            DUM1=2.0*EPS/RHO(I)                                             ENTR-MOD
3747            GO TO 415
3748      405   EPS=EPS1*VINTR(I)
3749            ENL(3)=0.                                                       ENTR-MOD
3750            DO 410 J=1,NNLEQ                                                ENTR-MOD
3751      410   AM(3,J)=2.*EPS/EL(I)*AM(2,J)
3752            AM(3,1)=AM(3,1)-2./ALPH*EPS                                     ENTR-MOD
3753            CALL LIAD(-1,3,NETA+I-2,DUM1)                                   ENTR-MOD
3754            DUM1=EPS/RHO(I)                                                 ENTR-MOD
3755      415   DUM=DUM1*DRHOH
3756            EPSA(I)=EPS
3757            AM(3,1)=AM(3,1)-C56*C10*DUM
3758            AM(3,I+3)=AM(3,I+3)+DUM*C10                                     ENTR-MOD
3759            J=MAT1J+I+1                                                     ENTR-MOD
3760            L=MAT1J
3761            DO 420 K=NUL,NSPM1
3762            IF(I-NETA) 418,416,416
3763      416   CALL LIAD(K,3,1,DUM)
3764            GO TO 419                                                       ENTR-MOD
3765      418   AM(3,J)=AM(3,J)+DUM                                             ENTR-MOD
3766      419   J=J+MAT2J                                                       ENTR-MOD
3767      420   DUM=DUM1*DRHOK(K+1)
3768            DEPC=ENL(3)
3769      445   RETURN                                                          ENTR-MOD
3770     1834   CONTINUE
```

```
C**** MODIFIES ENL AND AM AFTER IMONE
      L=I-1
      SALPH=-ALPH/TTVC
      IF(I-2) 650,650,600
 1005 CONTINUE
C**** MODIFIES ENL AND AM AFTER ICNLY
      L=I
      SALPH= ALPH/TTVC
  600 IFPP=L+NETA-2
      ISPP=L
      DUM=F(3,L)/SALPH
      ENL(I+3)=ENL(I+3)-DUM*(EPS-DEPC)
      AM(I+3,1)=AM(I+3,1)-DUM*EPS/ALPH
      C28=C28+DUM*EPS
      DO 605 J=1,NNLEQ
  605 AM(I+3,J)=AM(I+3,J)+DUM*AM(3,J)                                    ENTR-MOD
      CALL LIAD(-1,I+3,IFPP,EPS/SALPH)
      MPJ=MAT1J+I
      PRF=1.-1./PRT
      EG1=G(2,L)/(SALPH*PRT)
      EG4=-PRF/SALPH*C13*F(2,L)                                           ENTR-MOD
      EG3=EG4*EPS                                                         ENTR-MOD
      EG4=EG4+EG1                                                         ENTR-MOD
      EG2=EPS/SALPH*(1./SCT-1./PRT)*(HP-CPBAR(L)*TP)
      ENL(MPJ)=ENL(MPJ)-EG1*(EPS-DEPC)-EG2-EG3
      C32=C32+EG1*EPS+EG2+EG3
      AM(MPJ,1)=AM(MPJ,1)-EG1/ALPH*EPS-3.0/ALPH*EG3
      DO 610 J=1,NNLEQ
  610 AM(MPJ,J)=AM(MPJ,J)+EG4*AM(3,J)                                    ENTR-MOD
      AM(MPJ,L+3)=AM(MPJ,L+3)-PRF*C13/SALPH*EPS
      CALL LIAD(-1,MPJ,NETA+L-2,-PRF*C10/SALPH*EPS)
      CALL LIAD(0,MPJ,ISPP,EPS/(SALPH*PRT))
      IF(NSPM1) 650,650,615
  615 DO 630 K=1,NSPM1
      DUM=SP(2,L,K)/(SALPH*SCT)
      MPJ=MPJ+MAT2J
      CK6(K)=CK6(K)+DUM*EPS
      ENL(MPJ)=ENL(MPJ)-DUM*(EPS-DEPC)
      AM(MPJ,1)=AM(MPJ,1)-DUM/ALPH*EPS
      DO 620 J=1,NNLEQ
  620 AM(MPJ,J)=AM(MPJ,J)+DUM*AM(3,J)                                    ENTR-MOD
  630 CALL LIAD(K,MPJ,ISPP,EPS/(SALPH*SCT))
  650 IF(KR(17)) 660,660,655
  655 WRITE(KOUT,640) EPSOUT
  640 FORMAT(//(1P10E12.3))
  660 RETURN
      END
C819T
      SUBROUTINE TRANCR(IGO)
      COMMON/COECOM/              C5,C6,C7,C8,C9,C10,C11,C12,C13,C14,C15819T   4
     1,C16,(17,C18,C19,C20,C21,C22,C23,C24,C25,C26,C27,C28,C29,C30,C31,C819T   5
     232,C33,C34,C35,C36,C37,C38,C39,C40,C41,C42,C43,C44,C45,C46,C47,C48819T   6
     3,C49,C50,C51,C52,C53,C54,C55,C56,C57,C58,C59,C60,C61,C62,C63,C64,C819T   7
     465,C66,C67,C68,C69,C70,C71,C72,C73,C74,C75,C76,C77,C78,C79,C80,C81819T   8
     5,C82,C83,C84,C85,C86,C87,C88                                      819T   9
      COMMON/COECOM/ CK1( 8),CK2( 8),CK3( 8),CK4( 8),CK5( 8),CK6( 8)     819T  10
     1,CK7( 8),CK8( 8),CK9( 8),CK10( 8),CK11( 8),CK12( 8),CK13( 8)       819T  11
     2,CK14( 8),CK15( 8),CK16( 8),CK17( 8),CK18( 8),CK19( 8),CK20( 8)    819T  12
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3829          3,CK21( 8),CK22( 8),CKK1( 8, 8),CKK2( 8, 8),XM(5),XG(5),XSP(5, 9)  B19T  13
3830          4,CKK3( 8, 8)                                                      B19T  14
3831           COMMON/EDGCOM/              PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,B19T  15
3832          1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMNE,CGE,C90  ENTR-MOD
3833          2,OSIP(40),IDSIP,TTVC,TVCC(40),HEA(40),SF(20),CS(20),CSPR(20),      ENTR-MOD
3834          3CG(20),CGP(20),SREF,GEP,NEN                                       ENTR-MOD
3835           COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)       B19T  18
3836          1,LAR(153),BA1(43,18),BA2(30,15)                                   B19T  19
3837           COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8B19T  20
3838          1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HHUE,HFN,DLX2  B19T  21
3839          2,C3M(40),BETAM(40)                                                B19T  22
3840           COMMON/INTCOM/ KR(20),KIN,KCUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,MB19T  23
3841          1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B19T  24
3842          2,B(8),       MNE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B19T  25
3843          3,KAUXO,JTIME,JSPEC,MD(3)                                          B19T  26
3844           COMMON/NONCOM/AM(153,153),DVNL(153),TCN,                          B19T  27
3845          1VLNKW,DLPH( 9),DLPK( 8, 9),DTHW,DTKW( 8),FLUXJB( 9)               B19T  28
3846           COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) B19T  29
3847          1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),M'D(10),ITF( 50),IPRE,RADNO,  B19T  30
3848          2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                            B19T  31
3849           COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15)    B19T  32
3850          1,CPBAR(15),VMW(15),PHIK(15, 8),DRHOW,DRHOK( 8),ZK( 8),DZKM( 8),  DB19T  33
3851          2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKW( 8),DPRK( 8),DSCK( 8),DCAPCK( 8)B19T  34
3852          3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 6),DZKK( 8, 8)   B19T  35
3853          4,DPHIKK( 8, 8),       DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL  B19T  36
3854          5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMJ(15),  RHOP B19T  37
3855          6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15)    B19T  38
3856           COMMON/TEPCOM/SPDUM( 8),DER(40),DUMM1(15),SLOPE(15),REDUM(15)      B19T  39
3857          1,SDUM1(40),SDUM2(40),FWDUM(40),XICON(40),FWCON(40),FWINIT( 1)     B19T  40
3858          2,XIINIT( 1),DUDS( 40)                                             B19T  41
3859           COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                     B19T  42
3860           GO TO (1001,1002,1003,1004), IGO
3861      1001 LOW=1
3862           IF(KR(6)) 20,20,35
3863        20 LIM= NSD(1)
3864           DO 25 IS=2,LIM
3865           SDUM1(IS) = S(IS) * S(IS)
3866        25 SDUM2(IS) = 1.-ROKAP(IS)/S(IS)
3867           SDUM1(1)=0.
3868           SDUM2(1)=0.
3869           CALL SLOPC(LIM, SDUM1, SDUM2, DER, DER)
3870           DO 38 IS=2,LIM
3871           DUM=1. - SDUM2(IS)
3872        38 TVCC(IS) = SQRT(4.*DER(IS)*(DUM-SDUM1(IS)*DER(IS))+ SDUM2(IS)/SDUM
3873          1(IS)*(1.+DUM))/DUM
3874           TVCC(1) = SQRT(6.*DER(1))
3875           LOW=2
3876           IL=1
3877           IF(NDISC) 50,50,40
3878        35 IL=0
3879        40 LIM=NDISC+1
3880           DO 45 II=LOW,LIM
3881           M=NSD(II)
3882           CALL SLOPO(NSD(II), S(M), ROKAP(M), DER(M), DER(M))
3883           MM=M+IL
3884           IL=1
3885           IGM=M+NSD(II)-1
3886           DO 45 IS=MM,IGM
```

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3887        45 TVCC(IS) = SQRT(1.-DER(IS)*DER(IS))/ROKAP(IS)
3888        50 DO 55 IS=1,NS                                                ENTR-MOD
3889        55 TVCC(IS)=-TVCC(IS)*2.*C3M(IS)*VMUE(IS)
3890           RETURN
3891      1002 CONTINUE
3892     CALLED IMMEDIATELY AFTER ICOEFF
3893           IF(I-1) 115,115,125
3894       115 RHS=0.
3895           DO 120 J=1,MMLEQ
3896       120 AM(4,J)=0.                                                  ENTR-MOD
3897           GO TO 130
3898       125 IND=I-1
3899           SIX=-6.
3900           GO TO 140
3901       130 IND=I
3902           SIX=6.
3903           C27=DRHOH
3904           DO 135 K=1,NSPM1
3905       135 CK11(K)=DRHOK(K)
3906           IF(I-1) 165,165,140
3907       140 DUM=DETA(I-1)/2. *RHOE(IS)/RHO(IND)
3908           IF(KQ(9).LT.0) DUM=-DUM
3909           RHS=RHS+DUM*(1.+RHOP(IND)/RHO(IND)*DETA(I-1)/SIX)
3910           DUM=-DUM/RHO(IND)
3911           LPS=MAT1J+IND+1
3912           IF(NSPM1) 155,155,145
3913       145 LPI=LPS
3914           DO 150 K=1,NSPM1
3915           LPI=LPI+MAT2J
3916       150 AM(4,LPI)=AM(4,LPI)+DUM*CK11(K)                             ENTR-MOD
3917       155 DUM=DUM*C27
3918           AM(4,LPS)=AM(4,LPS) + DUM                                   ENTR-MOD
3919           DUM=DUM*C7*F(2,IND)
3920           AM(4,IND+3) = AM(4,IND+3) + DUM                             ENTR-MOD
3921           AM(4,1)= AM(4,1)-DUM/ALPH*F(2,IND)                          ENTR-MOD
3922           IF(IND-I) 130,160,160
3923       160 TTVC=AMAX1(1.+RHS*ALPH*TVCC(IS),0.0001)
3924       165 RETURN
3925      1003 CONTINUE
3926     CALLED IMMEDIATELY AFTER IMONE
3927           IND=I-1
3928           DUM1=-TVCC(IS)/TTVC
3929           GO TO 285
3930      1004 CONTINUE
3931           IND=I
3932           DUM1=TVCC(IS)/TTVC
3933       285 DUM2=DUM1*C28
3934           DUM3=DUM1* C32
3935           AM(I+3,1)=AM(I+3,1)+DUM2*RHS
3936           M= MAT1J+I
3937           AM(M,1)=AM(M,1)+DUM3*RHS
3938           DUM2=DUM2*ALPH
3939           DUM3=DUM3* ALPH
3940           DO 210 J=1,MMLEQ
3941           AM(I+3,J)=AM(I+3,J)+DUM2*AM(4,J)                            ENTR-MOD
3942       210 AM(M,J)=AM(M,J)+DUM3*AM(4,J)                                ENTR-MOD
3943           IF(NSPM1) 225,225,215
3944       215 DO 220 K=1,NSPM1
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      DUM3=DUM1*CK5(K)                                                          ENTR-MOD
      M=M0+MAT2J
      AM(M,1)=AM(M,1)+DUM3*RHS
      DUM3=DUM3*ALPH
      DO 220 J=1,MMLEQ
  220 AM(M,J) = AM(M,J) + DUM3*AM(4,J)                                          ENTR-MOD
  225 RETURN
      END
C828A
      SUBROUTINE EQUIL(KQ,Z,PRR)                                                828A 001
      INTEGER FAMOA,FAMOB                                                       828A 002
      EQUIVALENCE(TU( 72),TF),(VNU,CIJ)                                         828A 004
      DIMENSION CIJ( 71,1),TF(1)                                                828A 005
      COMMON/TENCOM/APE(16,16),BS(16)                                           828A 007
      DIMENSION VLAM( 71,1),  X(16),GAMK( 71,1),KQ(10),DQJRNL( 71,1)            ENTR-MOD
      EQUIVALENCE(AM( 74),DQJRNL( 76),GAMK,VLAM)                                828A 009
      COMMON /BLQCOM/FAMOA( 71),FAMOB( 71),M     ,FR( 71,15),W(3),LEF(10)       828A 010
     1,LEFS(10),PIEASE,LEFW(10),L2,L3                                           828A  11
      COMMON/BUMCOM/     BUMP,CORMA,EASE,ICORN,NOOT,TFZ,I777,DTEMP,KIP,IX       ENTR-MOD
      COMMON/EDGCOM/              PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,      828A  13
     1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMWE,CGE,C90          828A  14
     2,DSIP(40),IDSIP,TTVC,TVCC(40),HEA(40), SF(20),CS(20),CSPR(20),            ENTR-MOD
     3CG(20),CGP(20),SREF,GEP,MEN,UINF,RHOINF,HINF,PINF                         ENTR-MOD
      COMMON /EQPCOM/ RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2),       828A  17
     1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),MAT(10),          828A  18
     2 KAT(10),IR(10),IS,KR(10),LAMI( 71),P,T,TK(10, 7),VN( 71),                828A  19
     3 VNU( 71,10),ITFF,KR2,NCN,NCV,MM,MTM( 71),Y( 71),YM( 71),GG( 71)          828A  20
     4 ,TQ(10, 7),EPOVRK,SIGMA,BASMOL                                           828A  21
      COMMON /EQTCOM/SIP,HIP,EL,ENL,FLIU,CPF,IRE,IER,AA,ITS,IN,IL,IT,           828A  22
     1 MODE,MMELT,SMELT,TMAX,TMIN,MELT,SUMN,SUML,NS,NSS,01,ISP2,ISPQ,           828A  23
     2 ISP,KKJ,SVA,SVB,SVC,SVD,SUMC,FFF,CMF,EP,RV,IFCJC,MTG,MTL,JC,MG,          828A  24
     3 CPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),B(16),              ENTR-MOD
     4 IP( 71),ALP(10),PNU(10),GAMM(10),GAMF(10),SLAM(10),DY( 71),RVS,          828A  26
     5 CP( 71),M( 71),SB( 71),TC( 71),VLMK( 71),E( 71),PNUS(10),                828A  27
     6 BC(10),BLMK(10),BY(10),IBC(10),BE(10),JJ( 4)                             828A  28
      COMMON/FLPCOM/TXI(2),TUE(2),TRHOE(2),TTE(2),TVMUE(2),TMAT(566,2)          828A  29
     2,TMF(15,2),LEFT(10,2),TPE(2),TRADS(2),TDSIP(2),KOT(2)                     828A  30
      COMMON/FLXCOM/DELQN,DELJN( 8),DQNL(153),DJNL(153, 8),MALLQ                828A  31
     1,MALLJ( 8),QM,VJKM( 9),TPMALL                                             828A  32
      COMMON /INTCOM/KKR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,META,II,          828A  33
     1ISS,NS,ITT,NTIME,NSP,NSPM1,KAM,MLEQ,MMLEQ,MPNL,MITS,KAPPA,CBAR,           828A  34
     2CASE(15),BB(8),  MME,MON,KQ(10),ITER,MITER,KR17,MBT,MBT2,IDENT,           828A  35
     3KRS(48),KAUXO,JTIME,JSPEC,ND(3),IU,ISM                                    ENTR-MOD
      COMMON/MONCOM/AM(153,153),DVNL(153),TCM,                                  828A  37
     1VLMKM,DLPM( 9),DLPK( 8, 9),DTMM,DTKM( 8),FLUXJB( 9)                       828A  38
      COMMON /PRPCOM/PR(15),TT(15),RHO(15),SC(15),CAPC(15),QR(15),MM(15)        828A  39
     1,CPBAR(15),VMM(15),PMIX(15, 8),DRMOM,DRMOK( 8),ZK( 8),DZKM( 8),  DB28A  40
     2MU3K( 8),DMU4K( 8),DTK( 8),DPMIKM( 8),DPRK( 8),DSCK( 8),DCAPCK( 8)828A  41
     3,DMTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)    828A  42
     4,DPMIKK( 8, 8),       DMU4M,DMU3M,DMTILM,VMU12,CT,CTR,CPTIL,MTIL          828A  43
     5,VMU3,DTM,DCAPCM,DPRM,DSCM,DQRM,DCPBM,DCPTM,DMU12M,VMU(15),  RHOP  828A  44
     6(15),PMIXP(15),MP,TP,ZKP( 8),VMU3P,VMU4P,MTILP,CRHO(14),GRR(15)           828A  45
      COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                            828A  46
      COMMON/MALCOM/FM(40, 1),TM(40, 1),MM(40, 1),SPM( 8,40, 1)                 828A  47
     1,RHOVM(40, 1),FLUXJ( 3,40, 1),IMM,ITM,IFM,ISPM,IRHOVM,IFLUXJ              828A  48
      EQUIVALENCE(B,X)                                                          828A  49
    1 FORMAT(10I1,3F10.5)                                                       828A  946
    2 FORMAT(/9X6HTEMP =F10.4,17H DEG-K      PRES =F8.4,17H ATM      MOL WB28A 948
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4003          1T =F11.7)                                                    B20A 049
4004         3 FORMAT( /87H  SPECIES  PAR.PRES.     D-LOG-PP      LOG-PP      LOB20A 050
4005          1G-KP      FLAG    ERROR          CP  /(1X2A4,4E13.5,I5,2E13.5))  B20A 051
4006         4 FORMAT(/10X60H CP-FROZEN    CP-EQUIL    DLNM/DLNT    DLNM/DLNP    GB20A 052
4007          1AMMA         /10X5E12.5)                                     B20A 053
4008         7 FORMAT(I3,F8.2,11E10.3/91X3E10.3)
4009         8  FORMAT(10X10HENTHALPY =E14.7,20H CAL/GM    ENTROPY =E12.5,13H CAL/B20A 055
4010          1GM-DEG K/10X 9HDENSITY =E13.6, 8H LB/CUFT)                    B20A 056
4011         6 FORMAT(//)                                                    B20A 057
4012         9 FORMAT(5X 5HVEL =E10.3,16H FT/SEC   MACH =E10.3,  9H   AREA =E10.3B20A 058
4013          1,12H SQFT/LB/SEC)                                             B20A 059
4014        10 FORMAT(10X17HFRACTION LIQUID =F8.5)                           B20A 060
4015        42 FORMAT(8F10.4)                                               B20A 061
4016           DTU=500.
4017           DTD=DTU
4018           LEFUP=1                                                      B20A 063
4019           TTMIN=100.                                                   ENTR-MOD
4020           TTMAX=100000.                                                ENTR-MOD
4021           IQQ=0                                                        ENTR-MOD
4022           MELT=1                                                       ENTR-MOD
4023           FLIQ=0.                                                      ENTR-MOD
4024           HMELT=0.                                                     ENTR-MOD
4025           ITS=0                                                        B20A 065
4026           IG=0
4027           INV=0
4028           SPEASE=PIEASE
4029           TION=1000.                                                   ENTR-MOD
4030           IF(II.NE.NETA.AND.KR(5).EQ.0) TION=1000.                     ENTR-MOD
4031           ISP=IS+1                                                     B20A 066
4032           DO 302 I=1,6
4033       302 KR(I)=KQ(I)                                                  B20A 068
4034           MODE=KR(1)                                                   B20A 069
4035           IF(KR(5).NE.3)P=PRR                                          ENTR-MOD
4036           KKJ=0                                                        ENTR-MOD
4037           KR(8)=0
4038           KR(6)=KR(6)-1                                                B20A 071
4039           IF(KKR(18)-6) 3021,3021,3022
4040      3021 KR(7)=KKR(18)*5-9
4041           N7=51-KKR(18)*5
4042           GO TO 3023
4043      3022 KR(7)=0
4044           N7=KKR(18)*10-50
4045      3023 IF(KR(5)-1) 310,304,306
4046     C*****ISENTROPIC EXPANSION                                        B20A 074
4047        304 SIP=SIP-DSIP(ISS)                                          B20A 075
4048           IEW=2                                                        B20A 076
4049           II=NETA                                                      B20A 077
4050           GO TO 324                                                    B20A 078
4051     C*****STAGNATION POINT AND INITIALIZATION                         B20A 079
4052        306 IF(KR(5).EQ.3) GO TO 307                                   ENTR-MOD
4053           KR(8)=0
4054           ITFF=0
4055           PIEASE=0.
4056           KQ(6)=0                                                      B20A 081
4057           HIP=Z/1.8                                                    B20A 082
4058           MITS=1                                                       B20A 083
4059           II=NETA                                                      B20A 084
4060           VHW(NETA)=VMWE                                               ENTR-MOD
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4061            T=3000.                                                  B20A 085
4062            WM=20.                                                   B20A 086
4063            AA=P*WM                                                  B20A 087
4064            DO 309 I=1,IS
4065          309 ALP(I)=TQ(I,1)                                         B20A 089
4066            KR(6)=-1                                                 B20A 090
4067            IF(ITEM-1) 350,308,350
4068          308 IF(KKR(2)-2) 311,350,311
4069          310 IF(KR(6)) 312,330,330                                  B20A 092
4070          311 LEFUP = -1
4071            IF (KKR(12)-1) 384,350,384
4072        C*****SHOCK ENTROPY CALCULATION                              ENTR-MOD
4073          307 SA1=Z                                                  ENTR-MOD
4074            KKJ=-1                                                   ENTR-MOD
4075            SVA=(1.3146*RHOINF*UINF*COS(SA1))**2/90108.              ENTR-MOD
4076            SVB=SVA*2./1.9869                                        ENTR-MOD
4077            SVC=(UINF*COS(SA1))**2/90108.+HINF                       ENTR-MOD
4078            SVD=PINF+SVB/(1.3146*RHOINF)                             ENTR-MOD
4079            IF(SA1.GT.0.0001)GO TO 324                               ENTR-MOD
4080            P=PTE(1,1)                                               ENTR-MOD
4081            T=TCH                                                    ENTR-MOD
4082            GO TO 324                                                ENTR-MOD
4083        C*****BOUNDARY LAYER                                         B20A 093
4084          312 DO 3120 K=NSP,IS                                       ENTR-MOD
4085         3120 ALP(K)=0.                                              ENTR-MOD
4086            LEFUP=MITS+II-2
4087            HIP=Z/1.8                                                B20A 096
4088            ALP(NSP)=1.0                                             B20A 097
4089            IF(NSPM1) 3141,3141,313
4090          313 DO 314 K=1,NSPM1
4091            ALP(K)=SP(1,II,K)/WTM(K)                                 B20A 099
4092          314 ALP(NSP)=ALP(NSP)-SP(1,II,K)                           B20A 100
4093         3141 ALP(NSP)=ALP(NSP)/WTM(NSP)
4094            DO 319 I=1,IS                                            ENTR-MOD
4095            IF(KAT(I).EQ.99) GO TO 319                               ENTR-MOD
4096            ARPH=0.                                                  B20A 103
4097            ARPHM=0.                                                 B20A 104
4098            DO 315 K=1,NSP                                           B20A 105
4099            DUM=CIJ(I,K)*ALP(K)                                      B20A 106
4100            ARPHM=AMAX1(ARPHM,ABS(DUM))                              B20A 107
4101          315 ARPH=ARPH+DUM                                          B20A 108
4102            IF(II.EQ.1.AND.LEFW(I).EQ.1.AND.LEF(I).LE.0) LEF(I)=1    ENTR-MOD
4103            IF(ARPH-.0001*ARPHM) 316,316,319
4104          316 IF(II.EQ.1.AND.LEF(I).EQ.1) LEF(I)=0
4105            LEF(I)=-IABS(LEF(I))
4106            LEFS(I)=-IABS(LEFS(I))
4107          319 CONTINUE                                               B20A 111
4108          320 IF(ITFF) 326,350,350                                   B20A 112
4109        C*****ACCEPT RESIDENT VALUES AS FIRST GUESSES                B20A 113
4110          324 IF(T-TION) 328,398,398
4111          326 ITFF=ITFF+1                                            B20A 115
4112            IF(II-1) 323,323,322
4113          322 IG=1
4114            GO TO 350
4115         323  IF (ITFF) 327,329,329
4116          327 IF(KR2-1) 328,329,328
4117          329 GO TO 350
4118          328 IF(KAT(IS).EQ.99) LEF(IS)=-IABS(LEF(IS))               ENTR-MOD
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4119          IF(LEFUP) 393,364,393
4120      C*****WALL SOLUTION                                                B20A 118
4121        330 IEW=1                                                        B20A 119
4122          ITFF=-1                                                        B20A 120
4123          II=1                                                           B20A 122
4124          CHFLUX=W(3)
4125          PIEASE=PIEASE*0.989*(1.0-EASE)
4126          KR(7)=MAX0(KR(7),KKR(16)*5-4)
4127          IF(TT(1)/1.8.GT.TF(N+1)) KR(8)=1
4128          IF(MODE-1) 333,331,333                                         B20A 123
4129        331 TTMIN=TT(1)/1.8-500.
4130          TTMAX=TT(1)/1.8+500.
4131          KR(8)=0
4132        333 IF(KR(8).EQ.1) CHFLUX=-1.
4133          DO 332 K=1,IS
4134          IF(LEF(K)) 332,3331,332
4135       3331 IF(W(2)*TK(K,L2)+CHFLUX*TK(K,L3).LT.0.) LEF(K)=1
4136        332 ALP(K)=TQ(K,L2)*AMIN1(0.,W(2))+TQ(K,L3)*AMIN1(0.,W(3))+TQ(K,1)*
4137           1 AMIN1(0.,W(1))
4138          WS=-W(1)-W(2)-W(3)
4139          WSS=-AMIN1(0.,W(1))-AMIN1(0.,W(2))-AMIN1(0.,W(3))
4140          DO 335  L=NSP,IS                                               B20A 129
4141          DO 334 K=1,IS                                                  B20A 130
4142          GAMK(K,L)=0.                                                   B20A 131
4143        334 GAMK (L,K)=0.                                                B20A 132
4144          GAMH(L)=0.                                                     B20A 133
4145        335 GAMF(L)=0.                                                   B20A 134
4146          IF(NSPM1) 3361,3361,3351
4147       3351 DO 336 K=2,NSP
4148          GAMH(NSP)=GAMH(NSP)-DQJRNL(2,K)/WTM(NSP)*1.8                   B20A 136
4149          GAMF(NSP)=GAMF(NSP)-DQJRNL(1,K)/WTM(NSP)                       B20A 137
4150          ALP(NSP)=ALP(NSP)+WALLJ(K-1)/WTM(NSP)                          B20A 138
4151          ALP(K-1)=ALP(K-1)-WALLJ(K-1)/WTM(K-1)                          B20A 139
4152          GAMH(K-1)=DQJRNL(2,K)/WTM(K-1)*1.8                             B20A 140
4153          GAMF(K-1)=DQJRNL(1,K)/WTM(K-1)                                 B20A 141
4154          DO 336 KK=2,NSP                                                B20A 142
4155        336 GAMK(KK-1,NSP)=GAMK(KK-1,NSP)-GAMK(KK-1,K-1)                 B20A 143
4156       3361 DO 3362 K=1,IS
4157          DO 3362 J=ISP,N
4158       3362 VLAM(J,K)=WS*WTM(J)*GAMF(K)
4159          DUM1=NSPM1                                                     B20A 144
4160          DO 340 K=1,NSP                                                 B20A 145
4161          GAMH(K)=-GAMH(K)
4162          SUMG=0.                                                        B20A 146
4163          IF(NSPM1) 3392,3392,3391
4164       3391 DO 339 KK=1,NSP
4165          IF(KK-K) 337,339,337                                           B20A 148
4166        337 SUMG=SUMG+GAMK(KK,K)                                         B20A 149
4167        339 CONTINUE                                                     B20A 150
4168          SUMG=SUMG/DUM1                                                 B20A 151
4169          ALP(K)=-ALP(K)+SUMG/WTM(K)
4170       3392 DO 338 KK=1,NSP
4171        338 GAMK(KK,K)=-(GAMK(KK,K)-SUMG)/WTM(K)*WTM(KK)
4172          DO 340 KK=1,NSP                                                B20A 157
4173          DO 3401 J=ISP,N
4174       3401 VLAM(J,K)=VLAM(J,K)+GAMK(KK,K)*VNU(J,KK)
4175        340 GAMK(KK,K)=GAMK(KK,K)+WTM(KK)*GAMF(K)*WS
4176      C******RECALL STORED VALUES OF BOUNDARY LAYER SOLUTION AND          B20A 159
```

```
C     RE-INITIALIZED OMITTED SPECIES                                    B20A 160
  350 II=II-IG
      PIN=1.E-4*P
      PINL=ALOG(PIN)
      LIM=N+KR(8)
      DO 354 I=1,LIM
      IF(IFC(I)-1) 342,342,341                                          B20A 165
  341 IFC(I)=IFC(I)-3                                                   B20A 166
      GO TO 345                                                         B20A 167
  342 IF(IFC(I)+1) 343,345,345                                          B20A 168
  343 IFC(I)=IFC(I)+3                                                   B20A 169
  345 IF (IFC(I)) 346,349,346                                           B20A 170
  346 VN(I)=FR(I,II)*P
      IFC(I)=1                                                          B20A 172
      Y(I)=0.                                                           B20A 173
      IF(VN(I)) 347,347,354                                             B20A 175
  347 IFC(I)=-1                                                         B20A 176
      IF (I-IS) 348,348,354                                             B20A 177
  348 Y(J)=PINL                                                         B20A 178
      GO TO 3530
  349 IF(FR(I,II))357,357,352                                           B20A 180
  357 IF(VN(I)) 351,351,358
  358 IF(II-1) 353,351,353
  351 VN(I)=PIN                                                         B20A 183
      GO TO 353                                                         B20A 184
  352 VN(I)=FR(I,II)*P
  353 Y(I)=ALOG(VN(I)+1.E-35)
 3530 IF(II-1) 354,3531,354
 3531 IF(IS-I) 354,3532,3532
 3532 Y(I)=YW(I)
      IF(FR(I,1)-1.E-30) 354,3533,354
 3533 VN(I)=EXP(Y(I))
  354 CONTINUE                                                          B20A 187
      T=TT(II)/1.8                                                      B20A 188
      IF(T.GT.TION.OR.KAT(IS).NE.99) GO TO 356                          ENTR-MOD
      LEF(IS)=-IABS(LEF(IS))                                            ENTR-MOD
  356 WM=WMW(II)
      II=II+IG
      IF(LEFUP) 384,364,393
C*****REEVALUATE ABSENT ATOM ARRAY                                      B20A 193
  364 JT=MOD(ITEM,2)+1
      DO 382 K=1,IS                                                     ENTR-MOD
      LEFW(K)=0
      LEFS(K)=LEF(K)
      LEF(K)=ISIGN(LEFT(K,JT),LEF(K))
      IF(LEF(K)-2) 369,365,382                                          B20A 198
  365 IF(IU-1)369,369,367                                               ENTR-MOD
  367 IF(KKR(3)) 369,369,382
  369 LEF(K)=MIN0(LEF(K),0)                                             B20A 200
      IF (KKR(9)-2) 370,382,381
  370 DUM1=1.0                                                          B20A 202
      DUM2=0.                                                           B20A 203
      IF(NSPM1) 3721,3721,3701
 3701 DO 372 J=1,NSPM1
      DUM1=DUM1-SPM(J,ISS,ITT)                                          B20A 205
  372 DUM2=DUM2+SPM(J,ISS,ITT)*CIJ(K,J)                                 B20A 206
 3721 IF(ABS(DUM1)-1.E-7) 376,374,374
  374 DUM2=DUM2+DUM1*CIJ(K,NSP)                                         B20A 208
```

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4235       376 IF(DUM2) 382,382,380                                          B20A 209
4236       380 LEF(K)=1
4237           GO TO 382
4238      381  IF (W(2)*TK(K,L2)+W(3)*TK(K,L3).LT.0.0) LEFW(K)=1
4239       382 CONTINUE                                                      B20A 212
4240           GO TO 393                                                     B20A 213
4241      C*****INITIALIZE SP(,,) AND VN() ON FIRST STAGNATION SOLUTION      B20A 214
4242       384 ITFF=-NETA                                                    B20A 215
4243           NCV=0                                                         B20A 216
4244           TT(1)=3000.
4245           VMW(1)=20.
4246           KR2=KKR(2)
4247           IF(KR2.LT.0) KR2=1
4248           IF(KR2.EQ.1) GO TO 387
4249       385 DO 386 K=1,NSP
4250           DO 386 I=1,NETA                                               B20A 220
4251           SP(1,I,K)=ALP(K)*WTM(K)                                       B20A 221
4252           SP(2,I,K)=0.                                                  B20A 222
4253       386 SP(3,I,K)=0.                                                  B20A 223
4254           W(1)=0.
4255           W(2)=0.
4256           W(3)=0.
4257           DO 3868 I=1,IS                                                ENTR-MOD
4258           IF(KAT(I).EQ.99) GO TO 3867                                   ENTR-MOD
4259           LEF(I)=0                                                      B20A 226
4260           IF(TK(I,1)) 3868,3868,3867                                    B20A 227
4261      3867 LEF(I)=3                                                      B20A 228
4262      3868 CONTINUE                                                      B20A 229
4263       387 DO 388 I=1,IS                                                 B20A 230
4264           IF(ALP(I)) 393,388,388                                        B20A 231
4265       388 CONTINUE                                                      B20A 232
4266           DO 3881 J=1,N
4267           SB(J)=0.                                                      ENTR-MOD
4268           H(J)=0.                                                       ENTR-MOD
4269           DO 3881 I=1,NETA                                              ENTR-MOD
4270      3881 FR(J,I)=0.
4271           DO 392 I=1,IS                                                 B20A 233
4272           VN(I)=AMAX1(VN(I)/P*.1,ALP(I)*AA)                             B20A 234
4273           IF(IFC(I)) 390,391,390                                        B20A 235
4274       390 IFC(I)=1                                                      B20A 236
4275           Y(I)=0.                                                       B20A 237
4276           GO TO 392                                                     B20A 238
4277       391 Y(I)=ALOG(VN(I))                                              B20A 239
4278       392 CONTINUE                                                      B20A 240
4279      C*****DELETE MOLECULES BASED ON AESENT ATOM ARRAY                  B20A 241
4280       393 LAMD=1
4281           DO 3971 K=1,IS
4282           IF(LEF(K)) 394,3930,3934
4283      3934 IF(PIEASE-.99) 3931,3931,3933
4284      3930 IF(PIEASE-.01) 394,394,3933
4285      3933  IF (LEFS(K)) 3932,394,3931
4286      3931 IF(II-NETA) 397,3932,397                                      B20A 244
4287      3932 IF(LEF(K)-3) 394,397,394                                      B20A 245
4288       394 DO 396 J=1,N                                                  B20A 246
4289           IF(IABS(IFC(J))-1) 389,389,396                                B20A 247
4290       389 IF(MOD(LAMI(J)/LAMD,2)) 395,396,395
4291       395 VN(J)=0.
4292           IFC(J)=IFC(J)-3                                               B20A 250
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4293        396 CONTINUE                                                    B20A 251
4294            J=-IR(K)                                                    B20A 253
4295            IF(IFC(J)-1) 3961,3961,397                                  B20A 254
4296       3961 IFC(J)=IFC(J)+6                                             B20A 255
4297        397 LAMD=LAMD+LAMD
4298            LEF(K)=IABS(LEF(K))
4299       3971 LEFS(K)=IABS(LEFS(K))
4300       C*****DELETE CONDENSED SPECIES FROM BOUNDARY LAYER
4301            IF(KR(6)) 3980,398,398
4302       3980 DO 3984 J=1,N
4303            IF(IABS(IFC(J))-1) 3984,3981,3984
4304       3981 IFC(J)=IFC(J)-3
4305            VN(J)=0.
4306       3984 CONTINUE
4307        398 IF(KR(7)-1) 21,21,1902                                      B20A 258
4308       C*****EVALUATE PROPERTIES                                        B20A 259
4309        170 CPF=CPF/AA
4310            IF(KR(5).EQ.3) GO TO 19                                     ENTR-MOD
4311            HG=0.                                                       ENTR-MOD
4312            HL=0.                                                       ENTR-MOD
4313            WTL=0.                                                      ENTR-MOD
4314            SIP=0.                                                      ENTR-MOD
4315            DO 1703 J=1,N                                               ENTR-MOD
4316            SIP=SIP+VN(J)*(SB(J)-1.9869*Y(J))                           ENTR-MOD
4317            IF(IFC(J)) 1703,1704,1705                                   ENTR-MOD
4318       1704 HG=HG+VN(J)*H(J)                                            ENTR-MOD
4319            GO TO 1703                                                  ENTR-MOD
4320       1705 HL=HL+VN(J)*H(J)                                            ENTR-MOD
4321            WTL=WTL+VN(J)*WTM(J)                                        ENTR-MOD
4322       1703 CONTINUE                                                    ENTR-MOD
4323            SIP=SIP/AA                                                  ENTR-MOD
4324            HIP=(HG+HL)/AA                                              ENTR-MOD
4325            IF(KR(6)) 1701,1932,1702
4326       1702 RV=RVS+(RV-RVS)/EASE                                        ENTR-MOD
4327            IF(KR(8).GT.0) W(3)=W(3)-VN(N+1)/AA
4328            WS=-W(1)-W(2)-W(3)+1.E-38
4329            HIP=(HG+(HL-WTL/AA*HG)/WS)/AA
4330            GO TO 1932
4331       1701 IN=IS+2
4332            IG=MIN0(IQQ,-KKR(20))
4333            CALL RERAY(IN,A,0,0,0,0,IG,16)                              B20A 263
4334            ALF=A(2,1)/A(1,1)                                           B20A 265
4335            CSP=1./(A(1,1)*AA)                                          B20A 266
4336            BETH=P*(A(2,2)-A(1,2)*ALF)-1.                               B20A 267
4337            IF(MODE-3) 1931,1932,1931                                   B20A 268
4338       1931 CSP=CSP/T                                                   B20A 269
4339       1932 CALL PROPS                                                  B20A 270
4340            WM=AA/P
4341            GAM=1.-ALF
4342            GAM=1./(1.+BETH-1.9869/AA*GAM/CSP*GAM*P)
4343            GAR(II)=GAM
4344            IF(KR(5))195,195,194                                        B20A 271
4345        195 IF(KR(7))  11,11,194                                        B20A 272
4346        194 WRITE (KOUT,4) CPF,CSP,ALF,BETH,GAM
4347            ITS=-1                                                      B20A 276
4348       C*****OUTPUT PACKAGE                                             B20A 277
4349         19 WM=AA/P                                                     B20A 278
4350       1902 WRITE(KOUT,  2)T,P,WM                                       B20A 279
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4351          WRITE(KOUT,1901)W                                                  B20A 280
4352       1901 FORMAT(5X40HRELATIVE MASSES OF COMPONENTS 1,2 AND 3  3E12.5)      B20A 281
4353          SHIP=HIP                                                           B20A 282
4354          SSIP=SIP                                                           B20A 283
4355          HIP=0.                                                             B20A 284
4356          SIP=0.                                                             B20A 285
4357          DO 20 J=1,N                                                        B20A 286
4358          HIP=HIP+H(J)*SIGN(VN(J),WTM(J))
4359            20 SIP=SIP+ VN(J)*(SB(J)-1.9869*Y(J))                            B20A 288
4360          N=N+KR(8)
4361          HIP=(HIP+VN(MELT)*FLIQ*HMELT)/AA                                   B20A 289
4362          SIP=(SIP+VN(MELT)*FLIQ*SMELT)/AA                                   B20A 290
4363          RHR=P/T*WM/1.3146                                                  C20A 291
4364          WRITE(KOUT,8) HIP,SIP,RHR                                          B20A 292
4365          IF(FLIQ) 204,205,204                                               B20A 293
4366           204 WRITE(KOUT,10) FLIQ                                           B20A 294
4367           205 IF(ITS) 2051,203,203                                          B20A 295
4368          2051 IF(KR(5)-1) 203,202,201                                       B20A 296
4369           201 IF(KR(5).EQ.2)GO TO 200                                       ENTR-MOD
4370               Z=SIP                                                         ENTR-MOD
4371               GO TO 203                                                     ENTR-MOD
4372           200 HCH=HIP                                                       ENTR-MOD
4373               TCH=T                                                         ENTR-MOD
4374               SREF=SIP                                                      ENTR-MOD
4375           202 VELSQ=(HCH-HIP)*2.                                            B20A 298
4376               VMACH=SQRT(VELSQ/GAM*WM/(1.9869*T))                           B20A 299
4377               VEL=SQRT(VELSQ*45054.)                                        B20A 300
4378               UE(ISS)=VEL                                                   B20A 301
4379               HEA(ISS)=1.8*HIP                                              ENTR-MOD
4380               IF (VEL) 2021,2021,2022
4381          2021 AREA=0.
4382               GO TO 2023
4383          2022 AREA=1./(VEL*RHR)
4384          2023 WRITE(KOUT,9) VEL,VMACH,AREA
4385           203 IF(IQQ) 2036,1203,1203
4386          1203 IF(ITS) 2031,2036,2036                                        B20A 305
4387          2031 DO 2033 I=1,N                                                 B20A 306
4388          2033 VN(I)=VN(I)/P                                                 B20A 307
4389               WRITE(KOUT,2032)(FAMOA(I),FAMOB(I),VN(I),I=1,N)               B20A 308
4390               DO 2035 I=1,N                                                 B20A 309
4391          2035 VN(I)=VN(I)*P                                                 B20A 310
4392               IF(MODE-1) 2034,2037,2034                                     B20A 311
4393          2037 WRITE(KOUT,2038)  FAMOA(JC),FAMOB(JC)                         B20A 312
4394          2038 FORMAT(22H   SURFACE SPECIES IS 2A4)                          B20A 313
4395          2032 FORMAT(/3(5X7HSPECIES3X8HMOLE FR.2X)/(5X2A4,E12.5,5X2A4,E12.5,5X2A B20A 314
4396              14,E12.5))                                                     B20A 315
4397               GO TO 2034                                                    B20A 316
4398          2036 WRITE(KOUT,3) (FAMOA(I),FAMOB(I),VN(I),DY(I),Y(I),VLMK(I),IFC(I),E B20A 317
4399              1(I),CP(I),I=1,N)                                              B20A 318
4400          2034 WRITE(KOUT,6)                                                 B20A 320
4401               N=N-KR(8)
4402               IF(ITS) 11,1021,1021                                          B20A 321
4403          1021 HIP=SHIP                                                      B20A 322
4404               SIP=SSIP                                                      B20A 323
4405          C*****PRINCIPAL ITERATIVE LOOP                                     B20A 324
4406            21 IF(ITS)  109,110,109                                          B20A 325
4407           109 IF(MODE) 111,111,110                                          B20A 326
4408          1091 ITS=ITS+1
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4409        110 CALL THERM
4410        111 MODE=KR(1)                                                    820A 327
4411            IQQ=0                                                         820A 328
4412            FLIQ=0.
4413            CALL WATER                                                    820A 329
4414            B1=B(1)                                                       820A 331
4415        211 NOE=1                                                         820A 332
4416            IF(KR(7)-1) 2101,210,2102                                     820A 333
4417       2102 IQQ=-2                                                        820A 334
4418            WRITE(KOUT,2100)(I,I=1,IS)                                    820A 335
4419        210 WRITE(KOUT,7) ITS,T,AA,EL,ENL,CMF,(E(I),I=1,IS)
4420       2100 FORMAT (50H1ITS TEMP   PRES*WHT  EQUIL ER  MASBAL ER  SCALE  7(I3,
4421           17H MASBAL)/90X3(I3,7H MASBAL))
4422       2101 IF(ITS) 2103,221,221
4423       2103 IF(MODE-1) 170,2104,170                                       820A 337
4424       2104 TWALG=T                                                       820A 338
4425            GO TO 170                                                     820A 339
4426        221 ITS=ITS+1                                                     820A 340
4427            IF(ITS-50) 2219,2219,222                                      820A 341
4428       2219 IF(ITS-N7) 22 2222,2222
4429        222 IF(KKR(18)) 2226,2226,2225
4430       2225 WRITE(KOUT,2000)
4431       2000 FORMAT (///2X,50H------FOLLOWING OUTPUT NON-CONVERGENT-------------820A 344
4432           1-/70H  ISS,ITEM,II,MITS,ITS,IQQ,KR(6),HIP,SIP,TT(II)/ALP(I)/LEF(I)
4433           2/FR(I,II))
4434            WRITE(KOUT,3017)ISS,ITEM,II,MITS,ITS,IG,KR(6),HIP,SIP,TT(II)
4435            WRITE(KOUT,3018) ALP
4436            WRITE(KOUT,3019) LEF
4437            WRITE(KOUT,3018) (FR(I,II),I=1,N)
4438       3017 FORMAT(7I5,2X1P3E12.5)
4439       3018 FORMAT(2X1P10E11.4)
4440       3019 FORMAT(2X10I5)
4441            IQQ=-2
4442            KR(7)=1                                                       820A 350
4443       2226 ITS=-1                                                        820A 352
4444            NCV=NCV+1
4445            NON=NCV                                                       820A 353
4446            IF(NCV-20) 170,170,2220
4447       2220 MITS=100                                                      820A 354
4448            GO TO 170
4449       2222 KR(7)=3
4450            IQQ=-2
4451            GO TO 22
4452         22 ISPQ=IN+IL-1
4453            ICT=10                                                        820A 356
4454            DUM1=0.
4455            DO 2205 I=1,ISPQ
4456       2205 BS(I)=B(I)                                                    820A 357
4457            GO TO 2208                                                    820A 358
4458       2207 DO 2206I=IL,ISPQ                                              820A 359
4459       2206 B(I)=BS(I)                                                    820A 360
4460       2208 DO 2204 I=1,ISPQ                                              820A 361
4461            DO 2208 J=1,ISPQ                                              820A 362
4462       2208 APE(I,J)=A(I,J)                                               820A 363
4463            IF(I-2) 2204,2204,2201                                        820A 364
4464       2201 IF(IFC(I-2)-1) 2204,2204,2202                                 820A 365
4465       2202 B(I)=0.                                                       820A 366
4466            DO 2203 J=1,ISPQ                                              820A 367
                                                                              820A 368
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4467            APE(J,I)=0.
4468         2203 APE(I,J)=0.                                                  B20A 369
4469            APE(I,I)=1.0                                                   B20A 370
4470         2204 CONTINUE                                                     B20A 371
4471            IG=IQQ
4472            CALL RERAY(IN,APE(IL,IL),0,B(IL),1,0,IG,16)                    B20A 373
4473            ICT=ICT-1
4474            IF(ICT-IQQ) 222,2209,2210
4475         2209 IQQ=-2
4476         2210 IF(IG) 2212,2221,2221
4477         2212 IF(INV) 2216,2213,222
4478         2213 IF(KR(6)) 2227,2230,2230
4479         2230 LAMD=1
4480            DO 2229 K=1,IS
4481            J=-IR(K)
4482            IF(IFC(J).GT.1) GO TO 2229
4483            DO 2228 J=1,N
4484            IF(VN(J).GT.1.E-30 .AND. MOD(LAMI(J)/LAMD,2).NE.0) GO TO 2229
4485         2228 CONTINUE
4486            LEF(K)=-IABS(LEF(K))
4487            LEFN(K)=-IABS(LEFN(K))
4488            INV=-1
4489            ITS=1
4490            GO TO 393
4491         2229 LAMD=LAMD+LAMD
4492         2227 INV=-1
4493            PIN=P*1.E-5
4494            DO 2215 I=1,N
4495            IF(IFC(I)) 2215,2214,2215
4496         2214 VN(I)=VN(I)+PIN
4497            Y(I)=ALOG(VN(I))
4498         2215 CONTINUE
4499            GO TO 111
4500         2216 IF(KR(6)) 2217,222,222
4501         2217 ITS=999
4502            GO TO 111
4503      C*****IF TRYING TO PUSH THROUGH TMIN OR TMAX -- REINVERT AND DT TO ZERO B20A 374
4504          2221 IF(T-TMIN) 2223,227,228
4505          2223 T=TMIN
4506            GO TO 1891
4507           227 IF (X(1)) 228,228,228
4508           228 IF (T-TMAX) 223,229,2224
4509          2224 T=TMAX
4510            GO TO 1891
4511           229 IF(X(1)) 223,223,228                                        B20A 378
4512      C*****IF NEW CONDENSED HAS NEG CORRECTION, DELETE AFTER REINVERT      B20A 379
4513           223 IF(IER) 226,212,226                                         B20A 380
4514           226 IF(X(IER)+1.E-4) 225,212,212                                B20A 381
4515           225 DO 2252 I=1,ISPQ
4516            A(IER,I)=0.
4517          2252 A(I,IER)=0.
4518            BS(IER)=-1.E-8
4519            A(IER,IER)=1.0
4520            GO TO 2207                                                     B20A 384
4521      C*****IF S.E. ERROR AND CORRECTION OF T OF CONFLICTING SIGN,REINVERT  B20A 385
4522           212 IF(MODE-1) 224,213,224                                      B20A 386
4523           213 IF(X(1)*01+.00001) 224,218,218
4524      C*****ON S.E. IF DELTA LN T .GT. .9 REINVERT NO DT IF EL AND ENL ARE SMAB20A 39
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4525        218 IF(ABS(X(1))-0.9)224,224,228
4526      C*****IF CONVERGED EXCEPT FOR T ON H OR S OPTIONS  --  NON CONVERGENT   B20A 393
4527        228 IF(MODE-1) 2281,214,2280                                          B20A 394
4528       2280 IF(EL+100.*ENL-1.E-4) 222,222,2281                                B20A 395
4529      C*****ON S.E. OPTION RESULTIN IN CONFLICTING ERROR/CORRECTION OR T PUSH  B20A 396
4530      C*****IF OTHER BALANCES RELATIVELY GOOD, SET T TO TMIN/TMAX AS PER ERROR B20A 397
4531      C*****AND GO TO THERM (IF T ALREADY THERE - NONCONVERGE) ELSE DT TO ZERO B20A 398
4532        214 IF(ABS(B1)-100.*(EL+ENL)) 2281,215,215                            B20A 399
4533        215 TTMIN=TT(1)/1.8-588.
4534            TTMAX=TTMIN+1000.
4535            IF(B1) 216,216,217
4536        216 IF(T-TMIN) 178,178,2161                                           B20A 401
4537       2161 T=AMAX1(T-DTD,TMIN)
4538            TTMAX=T
4539            DTU=DTD/2.
4540            GO TO 1091
4541        217 IF(T-TMAX) 2171,178,178
4542       2171 T=AMIN1(TMAX,T+DTU)
4543            TTMIN=T
4544            DTD=DTU/2.
4545            GO TO 1091
4546       2281 X(1)=0.                                                           B20A 407
4547            MODE=0                                                          B20A 408
4548            IN=IN-1                                                         B20A 411
4549            IL=2                                                            B20A 412
4550            GO TO 2287                                                      B20A 413
4551        224 IF(X(2)+1.0)2240,2249,2249
4552       2240 BS(2)=0.
4553            A(2,2)=1.E25
4554            GO TO 2287
4555       2249 CALL CRECT(MODE)
4556            TMIN=TTMIN
4557            TMAX=TTMAX
4558            IF(KR(7)-1) 21,21,19                                            B20A 415
4559          11 PIEASE=SPEASE
4560            RETURN
4561            END                                                             B20A 417
4562      CB21A                                                                 B21A 001
4563            SUBROUTINE THERM                                                B21A 002
4564            DIMENSION CIJ( 71,1),TF(1)                                      B21A 003
4565            EQUIVALENCE(TU( 72),TF),(VMU,CIJ)                               B21A 004
4566            COMMON /BLOCOM/FAMOA( 71),FAMOB( 71),M     ,FR( 71,15),M(3),LEF(10) B21A   5
4567           1 ,LEFS(10),PIEASE,LEFM(10),L2,L3                                ENTR-MOD
4568            COMMON /EQPCOM/ RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2), B21A   7
4569           1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),MAT(10),  B21A   8
4570           2 KAT(10),IR(10),IS,KR(10),LAMI( 71),P,T,TK(10, 7),VM( 71),        B21A   9
4571           3 VMU( 71,10),ITFF,KR2,MCM,MCV,MM,MTM( 71),Y( 71),YM( 71),GG( 71)  B21A  10
4572           4 ,TQ(10, 7),EPOVRK,SIGMA,BARMOL                                 B21A  11
4573            COMMON /EQTCOM/SIP,NIP,EL,ENL,FLIQ,CPF,IRE,IER,AA,ITS,IN,IL,IT,   B21A  12
4574           1 MODE,MMELT,SMELT,TMAX,TMIN,MELT,SUMM,SUML,MS,MSS,B1,ISP2,ISPQ,   B21A  13
4575           2 ISP,KKJ,SVA,SVB,SVC,SVD,SUMC,FFF,CMF,EP,RU,IFCJC,MTG,MTL,JC,MG,  B21A  14
4576           3 CPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),B(16),      ENTR-MOD
4577           4 IP( 71),ALP(10),FMU(10),GAMM(10),GAMF(10),SLAM(10),DY( 71),RVS,  B21A  16
4578           5 CP( 71),M( 71),SB( 71),TC( 71),VLMK( 71),E( 71),PMUS(10),        B21A  17
4579           6 BC(10),BLMK(10),BY(10),IBC(10),BE(10),JJ( 4)                     B21A  18
4580            COMMON/INTCOM/KKR(20),KIN,KOUT
4581      5     MODE=KR(1)                                                              29
4582            IF (I-15) 50,10,50                                                      30
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4583      10    WTG=0.
4584            WTL=0.
4585            IF (KR(8)) 40,40,15
4586      15    IF (IFC(N+1)-1) 25,20,25
4587      20    IF (T+.001-TF(N+1)) 25,25,30
4588      25    IFC(N+1)=-1
4589            VN(N+1)=0.
4590      30    DO 35 K=1,IS
4591         35 VNU(N+1,K)=-TQ(K,L3)
4592            WTL=-VN(N+1)
4593      40    DUM2=0.
4594            SUMN=0.
4595            DO 45 I=1,IS
4596            PNUS(I)=0.
4597      45    SLAN(I)=0.
4598      50    WMELT=0.
4599            FLIQ=0.
4600            SMELT=0.
4601            MELT=1
4602            TMIN=TTMIN
4603            TMAX=TTMAX
4604            TFMAX=500.
4605            VA=ALOG(T/3000.)
4606            VB=T-3000.
4607            VC=(T+3000.)/2.
4608            VD=T*3000.
4609            VE=VC/(VD*VD)
4610            RT=1.9869*T
4611            I=1
4612            DO 235 IK=1,N
4613            J=2
4614            IF (IFC(I)+1) 165,85,85
4615      85    IF (IFC(I)) 90,95,120
4616      90    IF (MODE-1) 165,160,165
4617      95    IF (IT3) 165,100,165
4618     100    SUMN=SUMN+VN(I)
4619            DUM1=WTM(I)*VN(I)
4620            WTG=WTG+DUM1
4621            DUM2=DUM2+DUM1/FF(I)
4622            IF(VN(I).GT.1.E-29) Y(I)=ALOG(VN(I))
4623            IF (IK-IS) 105,105,110
4624     105    PNUS(I)=VN(I)
4625            SLAN(I)=VN(I)/FF(I)
4626            GO TO 165
4627     110    DO 115 K=1,IS
4628            DUM1=VNU(I,K)*VN(I)
4629            PNUS(K)=PNUS(K)+DUM1
4630     115    SLAN(K)=SLAN(K)+DUM1/FF(I)
4631            GO TO 165
4632     120    IF (IFC(I)-1) 125,125,165
4633     125    IF (IT5) 150,130,150
4634     130    IF (KR(6)) 145,135,135
4635     135    IF (T-TF(I)+.001) 140,140,145
4636     140    IFC(I)=-1
4637            VN(I)=0.
4638            GO TO 90
4639     145    WTL=WTL+VN(I)*WTM(I)
4640     150    IF (MODE-1) 165,155,165
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4641      155   TMIN=AMAX1(TMIN,TF(I))                                          100
4642      160   TFMAX=AMAX1(TF(I),TFMAX)                                        101
4643      165   IF (T-ABS(TU(I,1))) 170,175,175                                 102
4644      170   J=1                                                             103
4645      175   CP(I)=RC(I,J)+T*RD(I,J)+RE(I,J)/(T*T)                           104
4646            H(I)=RB(I,J)+VB*(RC(I,J)+RD(I,J)*VC+RE(I,J)/VD)                 105
4647            SB(I)=RF(I,J)+RC(I,J)*VA+VB*(RD(I,J)+RE(I,J)*VE)                106
4648            IF (MODE-2) 210,180,180                                         107
4649      180   IF (IFC(I)-1) 210,185,210                                       108
4650      185   IF (TU(I,1)) 190,210,210                                        109
4651      190   IF (T+TU(I,1)) 200,195,205                                      110
4652      195   HMELT=-H(I)-HMELT                                               111
4653            SMELT=-SB(I)-SMELT                                              112
4654            MELT=I                                                          113
4655            IF (J-2) 210,170,210                                            114
4656      200   TMAX=AMIN1(TMAX,-TU(I,1))                                       115
4657            GO TO 210                                                       116
4658      205   TMIN=AMAX1(TMIN,-TU(I,1))                                       117
4659      210   TC(I)=-H(I)/RT                                                  118
4660            VLNK(I)=TC(I)+SB(I)/1.9869                                      119
4661            IF (IK-IS) 215,215,220                                          120
4662      215   BLNK(I)=VLNK(I)                                                 121
4663            IBC(I)=IFC(I)                                                   122
4664            BC(I)=TC(I)                                                     123
4665            GO TO 235                                                       124
4666      220   DO 230 K=1,IS                                                   125
4667            IF (IBC(K)+1) 230,225,225                                       126
4668      225   VLNK(I)=VLNK(I)-VNU(I,K)*BLNK(K)                                127
4669            TC(I)=TC(I)-VNU(I,K)*BC(K)                                      128
4670      230   CONTINUE                                                        129
4671      235   I=I+1                                                           130
4672            IF (MODE-1) 250,240,250                                         132
4673      240   IF (TFMAX-T) 245,250,250                                        133
4674      245   T=TFMAX                                                         134
4675            IF(T-588.) 240,240,5
4676        240 WRITE(KOUT,249)
4677            STOP
4678        249 FORMAT(///38H NO AVAILABLE SURFACE SPECIES. . .STOP)
4679      250   IF (ITS) 385,255,385                                            136
4680      255   AA=P*WM                                                         137
4681      365   SUMN=SUMN/P                                                     180
4682            SUML=ALOG(SUMN)                                                 181
4683            FFF=WTG/DUM2                                                    182
4684            WTG=WTG/SUMN                                                    183
4685            WTL=WTL/SUMN                                                    184
4686            SUMC=1.0
4687            IF(KR(6)) 385,369,369
4688        369 DO 370 I=1,IS
4689            PMUS(I)=PMUS(I)/SUMN                                            186
4690      370   SLAM(I)=SLAM(I)/SUMN*FFF                                        187
4691      375   IF (WTL/WTG-WS) 385,385,380                                     191
4692      380   SUMC=WTL/(WTG*WS)                                               192
4693            WTL=WTL/SUMC                                                    193
4694      385   RETURN                                                          194
4695            END                                                             195
4696      C022A                                                         0022A 001
4697            SUBROUTINE WATER                                      0022A 002
4698            DIMENSION VLAM( 71,1),  X(16)                         0022A 005
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4699            EQUIVALENCE(AM( 74),VLAM)                                          B22A 006
4700            DIMENSION CIJ( 71,1),TF(1)                                         B22A 007
4701            DIMENSION ECD( 71)                                                 B22A 008
4702            EQUIVALENCE(TU( 72),TF),(VNU,CIJ)                                  B22A 009
4703            COMMON /BLQCOM/FAMOA( 71),FAMOB( 71),N     ,FR( 71,15),W(3),LEF(10)B22A  10
4704           1 ,LEFS(10),PIEASE,LEFW(10),L2,L3                                   ENTR-MOD
4705            COMMON/BUMCOM/     BUMP,CORMA,EASE,ICORM,WDOT,TFZ,I777,DTEMP,KIP,IXB22A  12
4706            COMMON /EQPCOM/ RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2),B22A  13
4707           1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),WAT(10),   B22A  14
4708           2 KAT(10),IR(10),IS,KR(10),LAMI( 71),P,T,TK(10, 7),VN( 71),         B22A  15
4709           3 VNU( 71,10),ITFF,KR2,HCH,NCV,WM,WTM( 71),Y( 71),YW( 71),GG( 71)   B22A  16
4710           4 ,TQ(10, 7),EPOVRK,SIGMA,BASMOL                                    B22A  17
4711            COMMON /EQTCOM/SIP,HIP,EL,ENL,FLIQ,CPF,IRE,IER,AA,ITS,IN,IL,IT,    B22A  18
4712           1 MODE,HMELT,SMELT,TMAX,TMIN,MELT,SUMN,SUML,WS,WSS,B1,ISP2,ISPQ,    B22A  19
4713           2 ISP,KKJ,SVA,SVB,SVC,SVD,SUMC,FFF,CMF,EP,RV,IFCJC,WTG,WTL,JC,HG,   B22A  20
4714           3 CPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),B(16),       ENTR-MOD
4715           4 IP( 71),ALP(10),FNU(10),GAMH(10),GAMF(10),SLAM(10),DY( 71),RVS,   B22A  22
4716           5 CP( 71),H( 71),SB( 71),TC( 71),VLNK( 71),E( 71),PNUS(10),         B22A  23
4717           6 BC(10),BLNK(10),BY(10),IBC(10),BE(10),JJ( 4)                      B22A  24
4718            COMMON/KINCOM/MT,FKF(10),EAK(10),EXK(10),PMU(10,10),RMU(10,10),    B22A  25
4719           1 DKPT(10),PKP(10),PKR(10),RAT(10),RSIG(10),MA(10),LL(10),PMR(10),  B22A  26
4720           2 PRMU(10,10),EESE(10)                                              B22A  27
4721            COMMON/NONCOM/AM(153,153),DVNL(153),TCW,                           B22A  28
4722           1VLNKW,DLPH( 9),DLPK( 8, 9),DTHW,DTKW( 8),FLUXJB( 9)                B22A  29
4723            COMMON/INTCOM/KKR(20),KIN,KCUT
4724            EQUIVALENCE(B,X)                                                   B22A 021
4725            WSS=WS                                                                28
4726            DO 5 I=1,IS                                                           29
4727       5    IBC(I)=IFC(I)                                                         30
4728            IF(KR(6)) 40,20,20
4729      20    IF (ITS) 25,40,40                                                     36
4730      25    DO 35 I=1,IS                                                          37
4731            IF (IBC(I)-1) 35,30,35                                                38
4732      30    IBC(I)=-1                                                             39
4733      35    CONTINUE                                                              40
4734      40    RV=WSS-WTL/WTG                                                        41
4735            IF(ITS.EQ.0) RVS =RV
4736            IF (KR(7)-1) 70,45,50                                                 42
4737      45    IF (ITS) 70,60,70                                                     43
4738      50    WRITE (KOUT,55) FFF,WTL,WTG,AA,RV,ALP,PNUS,SLAM                       44
4739      55    FORMAT (32H FFF,WTL,WTG,AA,RV/ALP/PNUS/SLAM/1X5E12.5/(1X10E12.5))     45
4740            KR(7)=KR(7)-1                                                         46
4741            IF (KR(7)-1) 70,60,70                                                 47
4742      60    WRITE (KOUT,65) (I,I=1,IS)                                            48
4743      65    FORMAT (50H1ITS TEMP   PRES*MWT  EQUIL ER  MASBAL ER  SCALE  7(I3,    49
4744           17H MASBAL)/90X3(I3,7H MASBAL))                                        50
4745      C     INITIALIZE                                                            51
4746      70    EL=0.                                                                 52
4747            CPG=0.                                                                53
4748            EP=0.                                                                 54
4749            CPF=0.                                                                55
4750            JC=0                                                                  56
4751            JCS=0                                                                 57
4752            ISP=IS+1
4753            ISPQ=IS+2                                                             58
4754            B(1)=0.                                                               59
4755            B(2)=0.                                                               60
4756            A(1,1)=0.                                                             61
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4757            A(1,2)=0.                                                       62
4758            A(2,1)=0.                                                       63
4759            A(2,2)=0.                                                       64
4760      C     -----INITIALIZE CONTRIBUTION OF MOST SIGNIFICANT SPECIES IN EACH M  65
4761            DO 75 I=1,IS                                                    66
4762            EB(I)=0.                                                        67
4763      75    E(I)=AA*ALP(I)                                                  68
4764            ISP2=ISPQ                                                       69
4765      C     - - - MAIN BASE SPECIES LOOP                                    70
4766            DO 325 IK=1,IS                                                  71
4767            I=2-IR(IK)                                                      72
4768            IF (KAT(IK)-99) 85,80,85                                        73
4769      80    PNUS(I-2)=0.                                                    74
4770      C     ZERO MATRIX                                                     75
4771      85    DO 90 K=1,ISPQ                                                  76
4772      90    A(K,I)=0.                                                       77
4773            IF (ITS) 110,95,110                                             78
4774      C     NORMALIZE ON PRESSURE ON FIRST PASS                             79
4775      95    VN(I-2)=VN(I-2)/SUMN                                            80
4776            ECD(I-2)=(1.-EASE)*Y(I-2)
4777            EBL(I-2)=0.                                                     81
4778            IF (IBC(I-2)) 110,100,105                                       82
4779      100   Y(I-2)=Y(I-2)-SUML                                              83
4780            GO TO 110                                                       84
4781      105   VN(I-2)=VN(I-2)/SUMC                                            85
4782      C     INITIALIZE SOME MORE                                            86
4783      110   B(I)=0.                                                         87
4784            A(I,1)=0.                                                       88
4785            IP(I-2)=0.                                                      89
4786      C     SET FLAG INDICATING SIGNIFICANCE OF SPECIES IN MASS             90
4787      C     BALANCE(S) AND INCREMENT COUNT ON SIGNIFICANT SPECIES           91
4788            IF (VN(I-2)-EBL(I-2)) 120,120,115                               92
4789      115   IP(I-2)=-1                                                      93
4790      C     TREAT BASE SPECIES CONTAINING BUT NOT REPRESENTING NON-PRESENT  94
4791      C     ELEMENTS IN SAME MANNER AS NON-PRESENT CONDENSED SPECIES         95
4792      120   IF (IBC(I-2)+1) 325,125,125                                     96
4793      125   IF (IBC(I-2)) 180,215,130                                       97
4794      130   A(I,I)=1.                                                       98
4795            VA=VN(I-2)                                                      99
4796            IF (IABS(IBC(I-2)-3)-1) 135,280,140                            100
4797      135   A(2,I)=1.0                                                     101
4798            GO TO 280                                                      102
4799      140   IF (EB(I-2)-ABS(VA)) 145,150,150                               103
4800      145   EB(I-2)=ABS(VA)                                                104
4801            IB(I-2)=I-2                                                    105
4802      150   E(I-2)=E(I-2)-VA                                               106
4803            IF (KR(6)) 155,160,160                                         107
4804      155   IF (MODE-1) 280,170,280                                        108
4805      160   DO 165 K=1,IS                                                  109
4806      165   A(K+2,I)=-WTM(I-2)*(PNUS(K)/WTG+GAMF(K))                       110
4807            A(I,I)=A(I,I)+1.                                               111
4808      170   TMIN=AMAX1(TMIN,TF(I-2))                                       112
4809            IF (T-TF(I-2)+.001) 175,175,180                                113
4810      175   A(I,I)=1.0E+10                                                 114
4811            E(I-2)=-VN(I-2)*1.001E+10                                      115
4812            MODE=0                                                         116
4813      180   IF (MODE-1) 185,190,185                                        117
4814      185   IF (KR(8)) 280,280,190                                         118
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4815      190   IF (TF(I-2)+.001-T) 325,195,195
4816      195   IF (JC) 205,205,200                                          119
4817      200   IF (Y(I-2)-BJC) 325,325,205                                  120
4818        205 BJC=Y(I-2)-ECO(I-2)                                          121
4819            JCS=JC
4820            TMAX=TF(I-2)                                                 123
4821            JC=I-2                                                       124
4822            IFCJC=IBC(I-2)                                               125
4823            IF (KR(8)) 210,210,280                                       126
4824      210   A(1,JCS+2)=0.                                                127
4825            A(1,I)=-1.0                                                  128
4826            B(1)=BJC                                                     129
4827            GO TO 325
4828      C     -----GAS PHASE                                               130
4829      215   VA=VN(I-2)                                                   131
4830            CPG=CPG+VA*CP(I-2)                                           132
4831            A(I,I)=VA                                                    133
4832            A(2,I)=VA                                                    134
4833            EP=EP-VA                                                     135
4834            IF (KAT(IK)-99) 220,275,220                                  136
4835      220   IF (KR(6)) 275,250,225                                       137
4836      225   DO 230 K=1,IS                                                138
4837        230 A(K+2,I)=(VLAM(I-2,K)+GAMH(K)*H(I-2))*VA                     139
4838            A(I,I)=A(I,I)+VA*RV
4839            DUM2=WTM(I-2)/WTG*WTL/WTG*VA                                 141
4840            DO 245 K=1,IS                                                142
4841                IF(EBL(K).GT.ABS(A(K+2,I))) GO TO 240                    143
4842            IP(I-2)=-1                                                   ENTR-MOD
4843            IF (EB(K)-ABS(A(K+2,I))) 235,240,240                         ENTR-MOD
4844      235   EB(K)=ABS(A(K+2,I))                                          144
4845            IB(K)=I-2                                                    145
4846      240   E(K)=E(K)-A(K+2,I)                                           146
4847      245   A(K+2,I)=A(K+2,I)+DUM2*PNUS(K)                               147
4848            GO TO 280                                                    148
4849      250   DUM1=WTM(I-2)/WTG*VA                                         149
4850            DUM2=WTL/WTG*DUM1                                            150
4851            IF (KR(4)) 255,255,260                                       151
4852      255   DUM1=0.                                                      152
4853            VA=(RV+1.)*VA                                                153
4854            GO TO 265                                                    154
4855      260   DUM1=DUM1*(1.-FFF/FF(I-2))                                   155
4856            VA=(RV+FFF/FF(I-2))*VA                                       156
4857      265   DO 270 K=1,IS                                                157
4858      270   A(K+2,I)=DUM1*SLAM(K)+DUM2*PNUS(K)                           158
4859            A(I,I)=A(I,I)+VA                                             159
4860      275   EB(I-2)=ABS(VA)                                              160
4861            IB(I-2)=I-2                                                  161
4862            E(I-2)=E(I-2)-VA                                             162
4863      280   IF (MODE-2) 320,300,285                                      163
4864      285   IF (IBC(I-2)) 325,295,290                                    164
4865      290   HOS=SB(I-2)
4866            GO TO 305                                                    166
4867      295   HOS=SB(I-2)-1.9869*Y(I-2)-1.9869                             167
4868            GO TO 310                                                    168
4869      300   HOS=H(I-2)                                                   169
4870            IF (IBC(I-2)) 325,310,305                                    170
4871      305   A(1,I)=HOS                                                   171
4872            GO TO 315                                                    172
                                                                             173
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4873      310   A(1,I)=HOS*VN(I-2)                                          174
4874      315   A(1,2)=A(1,2)-HOS*VN(I-2)                                   175
4875      320   CPF=CPF+CP(I-2)*VN(I-2)                                     176
4876      325   CONTINUE                                                    177
4877            DO 330 I=1,IS                                               178
4878            BE(I)=E(I)                                                  179
4879      330   BY(I)=Y(I)                                                  180
4880            IER=0                                                        30
4881            IRE=0                                                        31
4882            EER=0.                                                       32
4883      C     - - - MAIN NON-BASE SPECIES LOOP                             33
4884      350   LIM=N+KR(8)                                                  36
4885            IF (LIM-ISP) 730,355,355                                     37
4886      355   J=ISP                                                        38
4887            DO 725 IK=ISP,LIM                                            39
4888            IF (IK-N) 365,365,360                                        40
4889      360   E(J)= 1.E-10                                                 41
4890            IF (IFC(J)) 410,725,445                                      42
4891      365   IF (IFC(J)+1) 725,370,370                                    43
4892      370   IF (ITS) 390,375,390                                         44
4893      375   VN(J)=VN(J)/SUMN                                             45
4894            IF (IFC(J)) 390,385,380                                      46
4895      380   VN(J)=VN(J)/SUMC                                             47
4896            GO TO 390                                                    48
4897      385   Y(J)=Y(J)-SUML                                               49
4898      390   E(J)=VLNK(J)-Y(J)                                            50
4899            DO 405 I=1,IS                                                51
4900            IF (IBC(I)) 400,400,395                                      52
4901      395   FNU(I)=0.                                                    53
4902            GO TO 405                                                    54
4903      400   FNU(I)=VNU(J,I)                                              55
4904            E(J)=E(J)+FNU(I)*BY(I)                                       56
4905      405   CONTINUE                                                     57
4906            IF(KR(6)) 409,409,406
4907        406 IF(ITS) 408,407,408
4908        407 ECD(J)=(1.-EASE)*E(J)
4909        408 E(J)=E(J)-ECD(J)
4910        409 EAB=ABS(E(J))
4911            IF (IFC(J)) 410,590,445
4912      C     CONDENSED SPECIES                                            59
4913      410   EAB=E(J)                                                     60
4914            IF (KR(6)) 425,415,415                                       61
4915      415   IF (T-TF(J)+.001) 420,425,425                                62
4916      420   EAB=0.                                                       63
4917            IF (KR(8)) 535,535,545                                       64
4918      425   IF (E(J)-EER) 535,535,430                                    65
4919      430   EER=E(J)                                                     66
4920            IF (IER) 435,435,440                                         67
4921      435   ISPQ=ISPQ+1                                                  68
4922            IER=ISPQ                                                     69
4923      440   IE=IER                                                       70
4924            IRE=IK                                                       71
4925            GO TO 450                                                    72
4926      445   ISPQ=ISPQ+1                                                  73
4927            IE=ISPQ                                                      74
4928      450   WTR=0.                                                       75
4929            IF (KR(6)) 460,455,455                                       76
4930      455   TMIN=AMAX1(TF(J),TMIN)                                       77
                                                                           78
```

```
4931            WTR=WTM(J)/WTG                                          79
4932      460   DO 465 I=1,ISPG                                        80
4933            A(I,IE)=0.                                              81
4934      465   A(IE,I)=0.                                              82
4935            DO 480 K=1,IS                                           83
4936            DUM1=VNU(J,K)                                           84
4937            IF (IBC(K)-1) 470,470,480                               85
4938      470   VA=DUM1*VN(J)                                           86
4939            A(K+2,IE)=DUM1-WTR*(PNUS(K)+GAMF(K)*WTG)                87
4940            BE(K)=BE(K)-VA                                          88
4941            IF (ABS(VA)-EB(K)) 480,480,475                          89
4942      475   EB(K)=ABS(VA)                                           90
4943            IB(K)=IK                                                91
4944      480   CONTINUE                                                92
4945            K=IE-ISP2                                               93
4946            IF (IK-N) 505,505,485                                   94
4947      485   JJ(K)=JC                                                95
4948            B(IE)=Y(JC)                                             96
4949            IF (JC-IS) 495,495,490                                  97
4950      490   A(IE,1)=TC(JC)                                          98
4951            B(IE)=E(JC)                                             99
4952      495   EAB=-B(IE)                                             100
4953            IF (IFCJC) 715,715,500                                 101
4954      500   EAB=ABS(EAB)                                           102
4955            GO TO 715                                              103
4956      505   JJ(K)=J                                                104
4957            A(IE,1)=TC(J)                                          106
4958            B(IE)=E(J)                                             107
4959            IF (T+.001-TF(J)) 515,510,510                          108
4960      510   IF (KR(8)) 530,530,540                                 109
4961      515   IF (MODE-1) 520,525,520                                110
4962      520   IF (KR(6)) 530,525,525                                 111
4963      525   A(IE,IE)=1.E+10                                        112
4964            B(IE)=-VN(J)*1.001E+10                                 113
4965            MODE=0                                                 114
4966      530   IF (MODE-2) 535,575,580                                115
4967      535   IF (MODE-1) 715,540,715                                116
4968      540   IF (T-TF(J)-.001) 545,545,560                          117
4969      545   IF (JC) 555,555,550                                    118
4970      550   IF (E(J)-BJC) 725,725,555                              119
4971      555   BJC=E(J)                                               120
4972            JC=IK                                                  121
4973            IFCJC=IFC(JC)                                          122
4974            TMAX=TF(J)                                             123
4975            IF (KR(8)) 565,565,560                                 124
4976      560   IF (MODE-2) 725,575,580                                125
4977      565   B(1)=BJC                                               126
4978            DO 570 K=1,IS                                          127
4979      570   A(1,K+2)=-FNU(K)                                       128
4980            A(1,1)=TC(J)                                           129
4981            GO TO 725                                              130
4982      575   HOS=H(J)                                               131
4983            GO TO 585                                              132
4984      580   HOS=SB(J)                                              133
4985      585   A(1,IE)=HOS                                            134
4986            A(1,2)=A(1,2)-VN(J)*HOS                                135
4987            CPF=CPF+CP(J)*VN(J)                                    136
4988            GO TO 715                                              137
```

```
4989      C     GAS PHASE SPECIES
4990      590   IP(J)=0                                                    137
4991            IF (VN(J)) 595,715,595                                     139
4992      595   IQ=0                                                       140
4993            CPG=CPG+VN(J)*CP(J)                                        141
4994            IF (KR(6)) 625,600,605                                     142
4995      600   FFJ=FFF/FF(J)                                              143
4996      605   DUM1=WTM(J)/WTG*VN(J)                                      144
4997            DUM2=DUM1/WTG*WTL                                          145
4998            IF (KR(6)) 610,610,625                                     146
4999      610   IF (KR(4)) 615,615,620                                     147
5000      615   DUM1=0.                                                    148
5001            FFJ=1.0                                                    149
5002            GO TO 625                                                  150
5003      620   DUM1=DUM1*(1.-FFJ)                                         151
5004      625   DO 680 KI=1,IS                                             152
5005            I=2-IR(KI)                                                 153
5006            VA=VNU(J,I-2)*VN(J)                                        154
5007            IF (KAT(KI)-99) 630,645,630                                155
5008      630   IF (KR(6)) 645,640,635                                     156
5009      635   VA=VA*RV+VN(J)*(VLAM(J,I-2)+GAMM(I-2)*H(J))                157
5010            BE(I-2)=BE(I-2)-VA                                         158
5011            ABSVA=ABS(VA)                                              159
5012            VA=VA+PNUS(I-2)*DUM2                                       160
5013            GO TO 650                                                  161
5014      640   VB=VA*FFJ                                                  162
5015            VA=RV*VA+VB                                                163
5016            BE(I-2)=BE(I-2)-VA                                         164
5017            ABSVA=ABS(VA)                                              165
5018            VA=VA+SLAM(I-2)*DUM1+DUM2*PNUS(I-2)                        166
5019            GO TO 650                                                  167
5020      645   BE(I-2)=BE(I-2)-VA                                         168
5021            ABSVA=ABS(VA)                                              169
5022      650   IF (ABSVA-EBL(I-2)) 660,660,655                            170
5023      655   IQ=1                                                       171
5024            IF (ABSVA-EB(I-2)) 670,670,665                             172
5025      660   IF (ABS(VA)-EBL(I-2)) 680,680,670                          173
5026      665   EB(I-2)=ABSVA                                              174
5027            IB(I-2)=IK                                                 175
5028      670   DO 675 K=3,ISP2                                            176
5029      675   A(I,K)=A(I,K)+VA*FNU(K-2)                                  177
5030            B(I)=B(I)-VA*E(J)                                          178
5031            A(I,1)=A(I,1)-VA*TC(J)                                     179
5032            A(2,I)=A(2,I)+VN(J)*FNU(I-2)                               180
5033      680   CONTINUE                                                   181
5034            IF (IQ) 715,715,685                                        182
5035      685   EP=EP-VN(J)                                                183
5036            IP(J)=-1                                                   184
5037            B(2)=B(2)-VN(J)*E(J)                                       185
5038            A(2,1)=A(2,1)-VN(J)*TC(J)                                  186
5039            IF (MODE-2) 710,690,695                                    187
5040      690   MOS=H(J)*VN(J)                                             188
5041            GO TO 700                                                  189
5042      695   MOS=VN(J)*(SB(J)-1.9869*Y(J)-1.9869)                       190
5043      700   DO 705 I=3,ISP2                                            191
5044      705   A(1,I)=MOS*FNU(I-2)+A(1,I)                                 192
5045            A(1,2)=A(1,2)-MOS                                          193
5046            A(1,1)=A(1,1)-MOS*TC(J)                                    194
                                                                           195
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5047                B(1)=B(1)-HOS*E(J)
5048          710   CPF=CPF+VN(J)*CP(J)                                    196
5049          715   IF (EL-EAB) 720,725,725                                197
5050          720   EL=EAB                                                 198
5051          725   J=J+1                                                  199
5052          730   CONTINUE                                               200
5053                ISP3=IS+3                                              201
5054                IF (MODE-2) 785,735,760                                 29
5055          735   CPA=CPF*T                                               30
5056                SHMLT=HMELT*VN(MELT)                                    31
5057                EMS=AA*HIP+A(1,2)                                       32
5058                IF (KKJ+1) 750,740,750                                  33
5059          740   DUM1=SVA/AA*T*T                                         34
5060                EMS=AA*SVC-DUM1+A(1,2)                                  35
5061                HIP=-A(1,2)/AA                                          36
5062                A(1,2)=-AA*SVC-DUM1                                     37
5063                CPA=(CPF+2.*DUM1/T)*T                                   38
5064                DUM2=SVB/AA*T                                           39
5065                P=P-EP                                                  40
5066                EP=0.                                                   41
5067                IF (ABS(EMS/AA)-10.) 745,745,750                        42
5068          745   EP=-P+SVD-DUM2                                          43
5069                A(2,1)=A(2,1)+DUM2                                      44
5070                A(2,2)=-DUM2                                            45
5071          750   IF (KR(2)-MODE) 765,755,765                             46
5072          755   A(1,2)=-AA*HIP                                          47
5073                GO TO 765                                               48
5074          760   CPA=CPF                                                 49
5075                SHMLT=SMELT*VN(MELT)                                    50
5076                EMS=AA*SIP+A(1,2)-1.9869*(P-EP)                         51
5077                A(1,2)=-AA*SIP                                          52
5078          765   B(1)=B(1)+EMS                                           53
5079                A(1,1)=A(1,1)+CPA                                       54
5080                IF (SHMLT) 785,785,770                                  55
5081          770   IF (EMS) 785,785,775                                    56
5082          775   EMS=EMS-SHMLT                                           57
5083                B(1)=B(1)-SHMLT                                         58
5084                IF (EMS) 780,785,785                                    59
5085          780   FLIQ=1.+EMS/SHMLT                                       60
5086                MODE=0                                                  61
5087                A(1,1)=1.E+10                                           62
5088                TMIN=500.                                               63
5089                TMAX=5800.                                              64
5090          785   ENL=ABS(EP)/P*100.                                      65
5091                DO 810 I=3,ISP2                                         66
5092                E(I-2)=BE(I-2)                                          67
5093                EBL(I-2)=EB(I-2)*1.E-7                                  69
5094                A(I,2)=-AA*ALP(I-2)                                     70
5095                IF (IFC(I-2)-1) 795,795,790                             71
5096          790   NFM=NFM+1                                               72
5097                GO TO 810                                               73
5098          795   IF (KR(6)) 805,805,800                                  74
5099          800   A(I,1)=A(I,1)+GAMM(I-2)*T*CPG                           75
5100                E(I-2)=E(I-2)+MFL*GAMF(I-2)                             76
5101          805   ER=E(I-2)                                               77
5102                ABER=ABS(ER)/(EB(I-2)+1.E-20)                           78
5103                ENL=AMAX1(ABER,ENL)                                     79
5104                B(I)=B(I)+ER                                            80
                                                                            81
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5105      810   CONTINUE                                                        82
5106            IF (ISP2-ISPQ) 815,880,880                                      83
5107      815   IV=C                                                            84
5108            JZ=0                                                            85
5109      C     ADD CONDENSED NONBASE SPECIES TO ARRAY                          86
5110            DO 840 IE=ISP3,ISPQ                                             87
5111            J=IE-ISP2                                                       88
5112            J=JJ(J)                                                         89
5113            IF (J-IS) 820,820,830                                           90
5114      820   DO 825 K=1,IS                                                   91
5115      825   A(IE,K+2)=0.                                                    92
5116            A(IE,J+2)=-1.0                                                  93
5117            GO TO 840                                                       94
5118      830   DO 835 K=1,IS                                                   95
5119      835   A(IE,K+2)=-VNU(J,K)                                             96
5120      840   CONTINUE                                                        97
5121      C     ELIMINATE TERMS CORRESPONDING TO PRESENT BASE CONDENSED         98
5122            DO 855 K=1,IS                                                   99
5123            IF (IFC(K)) 855,855,845                                        100
5124      845   DO 850 IE=ISP3,ISPQ                                            101
5125      850   A(IE,K+2)=0.                                                   102
5126      855   CONTINUE                                                       103
5127      880   B(2)=EP+B(2)                                                   111
5128            IF(KR(6)) 5979,5979,5976
5129       5976 ENL=ABS(EP)/P*100.
5130            IF(MT) 5973,5973,5974
5131       5974 CALL KINET
5132       5973 CONTINUE
5133            DO 5975 I=1,IS
5134            IF(EB(I)) 5986,5986,5985
5135       5985 EB(I)=AMAX1(EB(I),ABS(E(I)))
5136            IF(ITS) 5978,5977,5978
5137       5977 EESE(I)=E(I)*(1.-EASE)
5138       5978 E(I)=E(I)-EESE(I)
5139            B(I+2)=B(I+2)-EESE(I)
5140       5986 EB(I)=ABS(EB(I))
5141            IF(IFC(I)-1) 5971,5971,5975
5142       5971 ENL=AMAX1(ENL,ABS(E(I)/(EB(I)+1.E-28)))
5143       5975 CONTINUE
5144       5979 CONTINUE
5145            IF (MODE-1) 910,890,885                                        112
5146      885   IF (ABS(EMS/A(1,1))-.0001) 910,910,920                         113
5147      890   IF (IFCJC) 895,900,905                                         114
5148      895   IF (JC-IRE) 900,905,900                                        115
5149      905   MODE=0                                                         117
5150            TMIN=TTMIN                                                     118
5151            TMAX=TTMAX                                                     119
5152      900   IF (ABS(B(1))-1.E-4) 910,910,920                               116
5153      910   IF (EL-1.E-4) 915,915,920                                      121
5154      915   IF (ENL-1.E-5) 935,935,920                                     122
5155      920   IN=ISPQ                                                        123
5156            IL=1                                                           124
5157            IF (MODE) 925,925,930                                          125
5158      925   IN=ISPQ-1                                                      126
5159            IL=2                                                           127
5160            X(1)=0.                                                        128
5161      930   RETURN                                                         129
5162      935   IT=IT+1                                                        130
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5163            ITS=-1
5164            GO TO 930                                                       132
5165            END                                                             133-
5166
5167      C823A                                                         823A  001
5168            SUBROUTINE CRECT(MOE)                                         823A  002
5169            INTEGER FAMOA,FAMOB                                           823A  004
5170            COMMON/INTCOM/KKR(20),KIN,KOUT
5171            DIMENSION CIJ( 71,1),TF(1)                                    823A  005
5172            EQUIVALENCE(TU( 72),TF),(VNU,CIJ)                             823A  006
5173            DIMENSION X(16)                                               823A  007
5174            DIMENSION CMFF( 71)                                           823A  008
5175            COMMON /BLQCOM/FAMOA( 71),FAMOB( 71),M     ,FR( 71,15),W(3),LEF(10)823A   9
5176           1 ,LEFS(10),PIEASE,LEFW(10),L2,L3                              ENTR-MOO
5177            COMMON /EQPCOM/ RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2),823A  11
5178           1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),WAT(10),  823A  12
5179           2 KAT(10),IR(10),IS,KR(10),LAMI( 71),P,T,TK(10, 7),VN( 71),        823A  13
5180           3 VNU( 71,10),ITFF,KR2,MCH,NCV,WM,WTM( 71),Y( 71),YW( 71),GG( 71)  823A  14
5181           4 ,TQ(10, 7),EPOVRK,SIGMA,BASMOL                               823A  15
5182            COMMON /EQTCOM/SIP,HIP,EL,ENL,FLIQ,CPF,IRE,IER,AA,ITS,IN,IL,IT,   823A  16
5183           1 MODE,HMELT,SMELT,TMAX,TMIN,MELT,SUMN,SUML,WS,WSS,B1,ISP2,ISPQ,   823A  17
5184           2 ISP,KKJ,SVA,SVB,SVC,SVD,SUMC,FFF,CMF,EP,RV,IFCJC,WTG,WTL,JC,MG,  823A  18
5185           3 CPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),B(16),      ENTR-MOO
5186           4 IP( 71),ALP(10),FNU(10),GAMN(10),GAMF(10),SLAM(10),DY( 71),RVS,  823A  20
5187           5 CP( 71),N( 71),SB( 71),TC( 71),WLNK( 71),E( 71),PNUS(10),        823A  21
5188           6 BC(10),BLNK(10),BY(10),IBC(10),EE(10),JJ( 4)                     823A  22
5189            EQUIVALENCE(DYA,DY)
5190            DIMENSION DYA(1,1)
5191            EQUIVALENCE(B,X)                                              823A  010
5192            CLIM=AMAX1(1.,M(2)+M(3))*0.2*WTG                                31
5193            DWTL=0.                                                         32
5194            DWTG=0.                                                         33
5195            DUMP=P*1.E-7                                                    34
5196            BUMP=P*1.E-6                                                    35
5197            BULP=ALOG(BUMP)                                                 36
5198            CMF=1.                                                          37
5199      5     K=0                                                             38
5200            DO 20 J=2,IS                                                    39
5201            IF (IB(J)-IB(J-1)) 10,15,20                                     40
5202      10    JA=IB(J)                                                        41
5203            IB(J)=IB(J-1)                                                   42
5204            IB(J-1)=JA                                                      43
5205            K=1                                                             44
5206            GO TO 20                                                        45
5207      15    IB(J)=1000                                                      46
5208      20    CONTINUE                                                        47
5209            IF (K) 25,25,5                                                  48
5210      25    IB(IS+1)=1000                                                   49
5211            M=IB(1)                                                         50
5212            M1=1                                                            51
5213            L=IS+2                                                          52
5214            I=0                                                             53
5215            LL=1                                                            54
5216            LIM=M+KR(9)                                                     55
5217            DO 260 IK=1,LIM                                                 56
5218            I=I+1                                                           57
5219            IF (IK-IS) 30,30,45                                             58
5220      30    SLAM(I)=0.                                                      59
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5221            IBC(I)=IFC(I)                                                   60
5222            PNUS(I)=0.                                                      61
5223            IF (IFC(I)-1) 35,35,75                                          62
5224      35    DYI=X(I+2)                                                      63
5225            IF (IFC(I)+1) 275,40,40                                         64
5226      40    IF (IFC(I)) 205,95,230                                          65
5227      45    IF (IFC(I)+1) 75,50,50                                          66
5228      50    IF (IFC(I)) 70,55,85                                            67
5229      55    VA=E(I)-TC(I)*X(1)                                              68
5230            DO 65 J=1,IS                                                    69
5231            IF (IBC(J)) 60,60,65                                            70
5232      60    VA=VA+VNU(I,J)*X(J+2)                                           71
5233      65    CONTINUE                                                        72
5234            DYI=VA                                                          73
5235            GO TO 95                                                        74
5236      70    IF (IK-IRE) 75,80,75                                            75
5237      75    DYI=0.                                                          76
5238            GO TO 275                                                       77
5239      80    IFC(I)=1                                                        78
5240            DYI=X(IER)                                                      79
5241            GO TO 230                                                       80
5242      85    L=L+1                                                           81
5243            IF (L-IER) 90,85,90                                             82
5244      90    DYI=X(L)                                                        83
5245            GO TO 230                                                       84
5246      95    DNTG=DNTG+VN(I)*DYI*WTM(I)                                      85
5247            IF (IP(I)) 100,195,100                                          86
5248     100    IF (IK-M) 105,145,105                                           87
5249     105    IF (VN(I)-DUMP) 110,140,140                                     88
5250     110    IF (MOE) 195,195,115                                            89
5251     115    IF (DYI) 120,275,125                                            90
5252     120    IF (VN(I)/BUMP-.9999995-CNF*DYI) 275,275,130                    91
5253     125    IF (BUMP/VN(I)-1.-CNF*DYI) 135,275,275                          92
5254     130    CNF=(VN(I)/BUMP-.9999995)/DYI                                   93
5255            GO TO 275                                                       94
5256     135    CNF=(BUMP/VN(I)-1.)/DYI                                         95
5257            GO TO 275                                                       96
5258     140    IF (MOE) 175,175,150                                            97
5259     145    M1=M1+1                                                         98
5260            M=IB(M1)                                                        99
5261     150    IF (DYI) 155,275,160                                           100
5262     155    IF (DYI*CNF+.999) 165,275,275                                  101
5263     160    IF (DYI*CNF-9.) 275,275,170                                    102
5264     165    CNF=-.999/DYI                                                  103
5265            GO TO 275                                                      104
5266     170    CNF=9./DYI                                                     105
5267            GO TO 275                                                      106
5268     175    IF (DYI*CNF-2.303) 180,190,190                                 107
5269     180    IF (DYI*CNF+6.909) 185,275,275                                 108
5270     185    CNF=-6.909/DYI                                                 109
5271            GO TO 275                                                      110
5272     190    CNF=2.303/DYI                                                  111
5273            GO TO 275                                                      112
5274     195    IF (Y(I)-BULP+ABS(DYI)*CNF) 275,200,200                        113
5275     200    CNF=-(Y(I)-BULP)/ABS(DYI)                                      114
5276            GO TO 275                                                      115
5277     C      NON-PRESENT BASE                                               116
5278     205    IF (KR(6)) 215,210,210                                         117
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5279      210   IF (T-TF(I)+.001) 275,215,215                                    118
5280      215   IF (Y(I)+CMF*DYI-0.1) 275,220,220                                119
5281      220   DUM1=(.1-Y(I))/DYI                                               120
5282            IF (DUM1-.001) 275,275,225                                       121
5283      225   CMF=DUM1                                                         122
5284            GO TO 275                                                        123
5285      230   DNTL=DNTL+DYI*WTN(I)                                             124
5286            IF (DYI) 235,275,250                                             125
5287      235   IF (VN(I)) 250,250,240                                           126
5288      240   IF (VN(I)+DYI*CMF) 245,250,250                                   127
5289      245   CMF=-VN(I)/DYI*1.00001                                           128
5290      250   IF (KR(6)) 265,255,255                                           129
5291      255   CLIP=ABS(CLIN/WTN(I))                                            130
5292            IF (ABS(CMF*DYI)-CLIP) 275,275,260                               131
5293      260   CMF=CLIP/ABS(DYI)                                                132
5294            GO TO 275                                                        133
5295      265   IF (ABS(CMF*DYI)-P) 275,275,270                                  134
5296      270   CMF=P/ABS(DYI)                                                   135
5297      275   CMFF(I)=CMF                                                      136
5298      280   DY(IK)=DYI                                                       137
5299            IF (KR(6)) 290,285,285                                           138
5300      285   RVL=AMAX1(.1,RV/2.)                                              139
5301            CMF=AMIN1(CMF,WTG/ABS(ABS(DNTL-DNTG/WTG*WTL)/RWL-DNTG))          140
5302      290   IF (KR(7)-1) 315,315,300                                         141
5303      295   FORMAT (1X2(8X2HVN9X1HY8X2HDY7X5HSCALE7X1HE4X6HIFC IP)/(1XA4,5E10. 142
5304           13,I3,I2,1X,A4,5E10.3,I3,I2))                                     143
5305      300   NQ=I                                                             144
5306            WRITE (KOUT,295) (FAMOA(J),VN(J),Y(J),DYA(J,LL),CMFF(J),E(J),IFC(J 145
5307           1),IP(J),J=1,NQ)                                                  146
5308            WRITE (KOUT,310) (EB(I),I=1,IS)                                  147
5309            WRITE (KOUT,310) (X(I),I=1,ISPQ)                                 148
5310            WRITE (KOUT,305) (IB(I),I=1,IS)                                  149
5311      305   FORMAT (10I5)                                                    150
5312      310   FORMAT (8E12.4)                                                  151
5313      315   CONTINUE                                                         152
5314            IF (X(1)) 320,360,320                                            153
5315      320   X1=X(1)*CMF                                                      154
5316            ABX=ABS(X(1))                                                    155
5317            IF (ABS(X1)-.5) 330,330,325                                      156
5318      325   CMF=.5/ABX                                                       157
5319            X1=CMF*X(1)                                                      158
5320      330   IF (X1) 340,360,335                                              159
5321      335   TM=TMAX                                                          160
5322            X1=AMIN1(.2,X1)                                                  161
5323            GO TO 345                                                        162
5324      340   TM=TMIN                                                          163
5325            X1=AMAX1(-0.2,X1)                                                164
5326      345   DTM=(TM-T)/(TM*X1)                                               165
5327            IF (DTM-1.) 350,355,355                                          166
5328      350   CMF=DTM*CMF                                                      167
5329            T=TM                                                             168
5330            GO TO 360                                                        169
5331      355   T=T/(1.-X1)                                                      17.
5332      360   AA=AA*EXP(CMF*X(2))                                              171
5333            M1=1                                                              30
5334            M=IB(1)                                                           31
5335            WTL=0.                                                            32
5336            WTG=0.                                                            33
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```
5337            DUM2=0.                                                  34
5338            I=1                                                      35
5339            LIM=KR(8)+N                                              36
5340            DO 495 IK=1,LIM                                          37
5341            DYI=CMF*DY(IK)                                           38
5342            IF (DYI) 395,390,395                                     39
5343      390   IF (IFC(I)) 495,435,485                                  40
5344      395   IF (IFC(I)) 455,400,400                                  41
5345      400   IF (IP(I)) 485,430,405                                   42
5346      405   IF (M-IK) 410,415,410                                    43
5347      410   IF (MOE) 430,430,420                                     44
5348      415   M1=M1+1                                                  45
5349            M=IB(M1)                                                 46
5350      420   VN(I)=VN(I)*(1.+DYI)                                     47
5351            IF (VN(I)) 430,430,425                                   48
5352      425   Y(I)=ALOG(VN(I))                                         49
5353            GO TO 435                                                50
5354      430   Y(I)=Y(I)+DYI                                            51
5355            VN(I)=EXP(Y(I))                                          52
5356      435   VA=WTN(I)*VN(I)                                          53
5357            WTG=WTG+VA                                               54
5358            DUM2=DUM2+VA/FF(I)                                       55
5359            IF (IK-IS) 440,440,445                                   56
5360      440   PNUS(I)=VN(I)                                            57
5361            SLAM(I)=VN(I)/FF(I)                                      58
5362            GO TO 495                                                59
5363      445   DO 450 K=1,IS                                            60
5364            VA=VNU(I,K)*VN(I)                                        61
5365            PNUS(K)=PNUS(K)+VA                                       62
5366      450   SLAM(K)=SLAM(K)+VA/FF(I)                                 63
5367            GO TO 495                                                64
5368      C     NON-PRESENT BASE CORRECTIONS AND TESTS                   65
5369      455   Y(I)=Y(I)+DYI                                            66
5370            IF (Y(I)) 495,460,460                                    67
5371      460   IF (IFC(I)+1) 495,465,465                                68
5372      465   IF (KR(8)) 475,470,470                                   69
5373      470   IF (T-TF(I)+.001) 495,475,475                            70
5374      475   Y(I)=0.                                                  71
5375            IFC(I)=+1                                                72
5376            GO TO 495                                                73
5377      480   VN(I)=VN(I)+DYI                                          74
5378            IF (VN(I)) 490,490,485                                   75
5379      485   WTL=WTL+VN(I)*WTN(I)                                     76
5380            GO TO 495                                                77
5381      490   VN(I)=0.                                                 78
5382            IFC(I)=-1                                                79
5383      495   I=I+1                                                    80
5384            FFF=WTG/DUM2                                             81
5385            DO 500 I=1,IS                                            82
5386      500   SLAM(I)=SLAM(I)*FFF                                      83
5387            RETURN                                                   84
5388            END                                                      85-
5389      C0244                                                  0244 001
5390            SUBROUTINE INPUT(PP)
5391            INTEGER FAMOA,FAMOB,CHAR,BLANK
5392            INTEGER AMOA,AMOB,ATA,ATB,ATC                          0244 005
5393            COMMON/INTCOM/KKR(20),KIN,KOUT
5394            DIMENSION CIJ( 71,1),TF(1)                             0244 006
```

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5395            DIMENSION UM(10,10)                                                 B24A  007
5396            EQUIVALENCE(TU( 72),TF),(VNU,CIJ)                                   B24A  008
5397            DIMENSION C(10),KPHA(2),RA(2), IM(10),JAT(8),ALPT(8),TAU(10,10)     B24A  009
5398            DIMENSION IC( 10),LIM(10,10)                                        B24A  010
5399            DIMENSION FFIN( 71),NFIA( 71),NFIB( 71)                             B24A  011
5400            DIMENSION IFMET( 71),IGMET( 71),ZIGEPS(2),SORCE(8)                  B24A  012
5401            COMMON /BLQCOM/FAMOA( 71),FAMOB( 71),N     ,FR( 71,15),W(3),LEF(10) B24A  13
5402           1 ,LEFS(10),PIEASE,LEFM(10),L2,L3                                    ENTR-MOD
5403            COMMON /EQPCOM/ RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2),  B24A  15
5404           1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),WAT(10),    B24A  16
5405           2 KAT(10),IR(10),IS,KR(10),LAMI( 71),P,T,TK(10, 7),VN( 71),          B24A  17
5406           3 VNU( 71,10),ITFF,KR2,HCH,NCV,WM,WTM( 71),Y( 71),YW( 71),GG( 71)    B24A  18
5407           4 ,TQ(10, 7),EPOVRK,SIGMA,BASMOL                                     B24A  19
5408            COMMON /EQTCOM/SIP,HIP,EL,ENL,FLIQ,CPF,IRE,IER,AA,ITS,IN,IL,IT,     B24A  20
5409           1 MODE,HMELT,SMELT,TMAX,TMIN,MELT,SUMN,SUML,WS,WSS,B1,ISP2,ISPQ,     B24A  21
5410           2 ISP,KKJ,SVA,SVB,SVC,SVD,SUMC,FFF,CMF,EP,RV,IFCJC,WTG,WTL,JC,HG,    B24A  22
5411           3 CPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),B(16),        ENTR-MOD
5412           4 IP( 71),ALP(10),FNU(10),GAMP(10),GAMF(10),SLAM(10),DY( 71),RVS,    B24A  24
5413           5 CP( 71),K( 71),SB( 71),TC( 71),VLNK( 71),E( 71),PNUS(10),          B24A  25
5414           6 BC(10),BLNK(10),BY(10),IBC(10),BE(10),JJ( 4)                       B24A  26
5415            COMMON/KINCOM/MT,FKF(10),EAK(10),EXK(10),PMU(10,10),RMU(10,10),     B24A  27
5416           1 DKPT(10),PKP(10),PKR(10),RAT(10),RSIG(10),MA(10),LL(10),PMR(10),   B24A  28
5417           2 PRMU(10,10),EESE(10)                                               B24A  29
5418      301   FORMAT (I3,F7.0,7F10.4)
5419       302 FORMAT(6E9.6,2F6.0,I1)
5420      3020 FORMAT(1X6E12.5,F10.4,F11.4,I2/1X6E12.5,F10.4,F11.4,I2)
5421      3021 FORMAT(2A4,E12.4,2A4,E12.4,2A4,E12.4,2A4,E12.4)                      B24A  029
5422       303 FORMAT(1H /1H )                                                      B24A  030
5423       304 FORMAT(I3,3A4,E9.3,7E8.3)
5424       305 FORMAT(54HORELATIVE ELEMENTAL COMPOSITIONS, ATOMIC WTS/UNIT MASS     B24A  032
5425          1/6X6HAT.NO.3X7HELEMENT4X9HATOMIC WT5X8HEDGE GAS4X10HPYRO.GAS 15X
5426          2 6HCHAR 15X10HPYRO.GAS 25X6HCHAR 25X10HPYRO.GAS 35X6HCHAR 3/
5427          3 (7XI3,3X3A4,F10.5,7F13.7))
5428       306 FORMAT(7(F3.0,I3), A2,9A4)
5429            DATA CHAR,BLANK/4HCHAR,4H    /
5430            P=PP
5431            KR(3)=2
5432            KR(2)=KKR(12)+1
5433            IF(KR(2).EQ.3.OR.KR(2).EQ.8) KR(3)=6
5434            IF(KR(2).EQ.7) GO TO 3751
5435      3062  MT=0
5436            FFA=0.489
5437            FITMOL=26.7
5438            FITGMW=24.3
5439            GGA = 0.454
5440            BASMOL=32.0
5441            SIGMA=3.467
5442            EPOVRK=106.7
5443            NFF=0                                                               B24A  042
5444            VINT=P*1.E-6                                                        B24A  043
5445            YINT=ALOG(VINT)                                                     B24A  044
5446            RMMG=1.                                                             B24A  045
5447            IF (KR(2)) 334,334,321                                              B24A  046
5448       321 READ(KIN,301) IS,FFAR,DUB2,DUB3,DUB4,DUB5,DUB6,DUB7,DUB8
5449            IF (DUB2.GT.0.) FITMOL=DUB2
5450            IF (DUB3.GT.0.) BASMOL=DUB3
5451            IF (DUB4.GT.0.) SIGMA=DUB4
5452            IF (DUB5.GT.0.) EPOVRK=DUB5
```

```
5453            IF (DUB6.GT.0.) GGA =DUB6
5454            IF (DUB7.GT.0.) FITSMW=DUB7
5455            IF(FFAR) 3213,3212,3211                                  B24A 048
5456         3213 FFA=0.                                                 B24A 049
5457            GO TO 3212                                               B24A 050
5458         3211 FFA=FFAR                                               B24A 051
5459         3212 CONTINUE                                               B24A 052
5460            JAT(6)=0                                                 B24A 053
5461            IX=3                                                     B24A 054
5462            IF (IS-10) 311,311,399                                   B24A 055
5463          311 READ(KIN,304) (KAT(J), ATA(J), ATB(J), ATC(J), HAT(J), (TK(J,I),
5464           1  I=1,7),J=1,IS)
5465            DO 327 K=1,7
5466            VA=0.                                                    B24A 059
5467            DO 322 J=1,IS                                            B24A 060
5468            IF(KAT(J)-99) 3111,325,3111                              B24A 061
5469         3111 IF(TK(J,K)) 324,322,325                                B24A 062
5470          324 VA=VA-TK(J,K)                                          B24A 063
5471            TK(J,K)=-TK(J,K)/HAT(J)                                  B24A 064
5472            GO TO 322                                                B24A 065
5473          325 VA=VA+TK(J,K)*HAT(J)                                   B24A 066
5474          322 CONTINUE                                               B24A 067
5475            IF(VA) 326,327,325
5476          326 DO 323 J=1,IS
5477          323 TK(J,K)=TK(J,K)/VA                                     B24A 069
5478          327 CONTINUE
5479            WRITE(KOUT,305) (KAT(J), ATA(J), ATB(J), ATC(J), HAT(J), (TK(J,I),
5480           1  I=1,7),J=1,IS)
5481            WRITE (KOUT,308)
5482         308  FORMAT(//3X61HTHERMODYNAMIC PROPERTY CURVE-FIT DATA (SEE MANUAL FO
5483           1R FORMAT)//)
5484            ISP=IS+1                                                 B24A 072
5485            IF(KR(3)) 399,399,334                                    B24A 073
5486          334 TFMAX=0.                                               B24A 074
5487            AAA=0.                                                   B24A 075
5488            N=0                                                      B24A 076
5489            II=ISP                                                   B24A 077
5490            J=1                                                      B24A 078
5491          342 READ(KIN,306)(ALPT(K),JAT(K),K=1,7),SORCE,AMOA,AMOB
5492            IF(ALPT(1)) 3421,399,3420
5493         3420 IF(JAT(1)) 344,3421,344
5494         3421 NFF=ABS(ALPT(1))
5495            READ(KIN,3021)(NFIA(I),NFIB(I),FFIN(I),I=1,NFF)          B24A 082
5496            GO TO 342                                                B24A 083
5497          344 DO 345 K=1,IS
5498          345 C(K)=0.
5499            DO 349 I=1,7
5500            IF(JAT(I)) 346,349,346
5501          346 DO 347 K=1,IS
5502            IF(JAT(I)-KAT(K)) 347,348,347
5503          347 CONTINUE
5504            READ(KIN,303)
5505            GO TO 342
5506          348 C(K)=ALPT(I)
5507          349 CONTINUE
5508            WT=0.
5509            L=1
5510            LAMKK=0
```

```
5511            DO 388 I=1,IS
5512            IF(C(I)) 387,388,387
5513         387 LAMKK=LAMKK+L
5514            WT=WT+C(I) * WAT(I)
5515         388 L=L+L
5516            IF(J-IS) 360,360,369
5517         360 JM=J-1                                                  B24A 099
5518            DO 3601 L=1,IS                                           B24A 100
5519        3601 CIJ(L,J)=C(L)                                           B24A 101
5520            LAMI(J) = LAMKK
5521            IF (JM) 320,320,313
5522         313 DO 314 L=1,JM                                           B24A 104
5523            IML=IM(L)                                                B24A 105
5524            UGH=C(IML)                                               B24A 106
5525            UM(L,J)=0.                                               B24A 107
5526            IF(UGH) 353,314,353                                      B24A 108
5527         353 DO 393 I=1,L                                            B24A 109
5528         393 UM(I,J)=UM(I,J)-UM(I,L)*UGH                             B24A 110
5529            DO 394 I=IML,IS                                          B24A 111
5530         394 C(I)=C(I)-.AU(I,L)*UGH                                  B24A 112
5531         314 UM(J,L)=0.                                              B24A 113
5532         320 DO 316 I=1,IS                                           B24A 114
5533            IF(ABS (C(I))-.001)316,316,317                           B24A 115
5534         316 TAU(I,J)=0.                                             B24A 116
5535            DO 396 I=1,JM                                            B24A 117
5536         396 VNU(II,I)=-UM(I,J)                                      B24A 118
5537            DO 397 I=J,IS                                            B24A 120
5538         397 VNU(II,I)=0.                                            B24A 121
5539            LAMI(II)=LAMKK                                           B24A 123
5540            GO TO 370
5541         317 IM(J)=I                                                 B24A 124
5542            UM(J,J)=1.                                               B24A 125
5543            DO 398 L=1,J                                             B24A 126
5544         398 UM(L,J)=UM(L,J)/C(I)                                    B24A 127
5545            DO 328 L=I,IS                                            B24A 128
5546         328 TAU(L,J)=C(L)/C(I)                                      B24A 129
5547            YC=YINT                                                  B24A 130
5548            KK=J                                                     B24A 131
5549            J=J+1                                                    B24A 132
5550            IF(J-IS) 372,372,329                                     B24A 133
5551         329 DO 330 L=2,IS                                           B24A 134
5552            JM=ISP-L                                                 B24A 135
5553            IMJ=IM(JM+1)                                             B24A 136
5554            DO 330 K=1,JM                                            B24A 137
5555            UGH=TAU(IMJ,K)                                           B24A 138
5556            DO 330 I=1,IS                                            B24A 139
5557         330 UM(I,K)=UM(I,K)-UGH*UM(I,JM+1)                          B24A 140
5558            DO 33? I=1,IS                                            B24A 141
5559         337 IMI=IM(I)                                               B24A 142
5560            IF(IMI-I) 336,333,336                                    B24A 143
5561         336 DO 338 K=1,IS                                           B24A 144
5562            V=UM(K,IMI)                                              B24A 145
5563            UM(K,IMI)=UM(K,I)                                        B24A 146
5564         338 UM(K,I)=V                                               B24A 147
5565            IM(I)=IM(IMI)                                            B24A 148
5566            IM(IMI)=IMI                                              B24A 149
5567            GO TO 337                                                B24A 150
5568         333 CONTINUE                                                B24A 151
                                                                         B24A 152
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      C-----ELEMENT -- BASE GAS CORRESPONDENCE                          B24A 153
      C      INITIALIZE ROW AND COLUMN SUMS                             B24A 154
             IG=IS                                                      B24A 155
             DO 401 I=1,IS                                              B24A 156
             IR(I)=-1                                                   B24A 157
        401  IC(I)=-1                                                   B24A 158
      C      EVALUATE INITIAL SUMS                                      B24A 159
             LAMD=1
             DO 402 I=1,IS
             DO 403 J=1,IS
             LIM(I,J)=MOD(LAMI(J)/LAMD,2)
             IC(J) = IC(J) + LIM(I,J)
        403  IR(I)= IR(I) + LIM(I,J)
        402  LAMD=LAMD+LAMD
      C      CHECK FOR ZEROS                                            B24A 167
        426  IZ=0                                                       B24A 168
        404  DO 412 I=1,IS                                              B24A 169
             IF(IC(I)-IZ) 408,405,408                                   B24A 170
        405  DO 406 J=1,IS                                              B24A 171
             IF(LIM(J,I)) 407,406,407                                   B24A 172
        406  CONTINUE                                                   B24A 173
        407  IC(I)=-J                                                   B24A 174
             IR(J)=-I                                                   B24A 175
             DO 428 K=1,IS                                              B24A 176
             LIM(J,I)=0                                                 B24A 177
             IF(LIM(J,K)) 425,427,425                                   B24A 178
        425  IC(K)=IC(K)-1                                              B24A 179
             LIM(J,K)=0                                                 B24A 180
        427  IF(LIM(K,I)) 422,428,422                                   B24A 181
        422  LIM(K,I)=0                                                 B24A 182
             IR(K)=IR(K)-1                                              B24A 183
        428  CONTINUE                                                   B24A 184
             GO TO 413                                                  B24A 185
        408  IF(IR(I)-IZ)  412,409,412                                  B24A 186
        409  DO 410 J=1,IS                                              B24A 187
             IF(LIM(I,J)) 411,410,411                                   B24A 188
        411  IC(J)=-I                                                   B24A 189
             IR(I)=-J                                                   B24A 190
             LIM(I,J)=0                                                 B24A 191
             GO TO 4101                                                 B24A 192
        410  CONTINUE                                                   B24A 193
       4101  DO 430 K=1,IS                                              B24A 194
             IF(LIM(K,J))424,429,424                                    B24A 195
        424  IR(K)=IR(K)-1                                              B24A 196
             LIM(K,J)=0                                                 B24A 197
        429  IF(LIM(I,K)) 423,430,423                                   B24A 198
        423  LIM(I,K)=0                                                 B24A 199
             IC(K)=IC(K)-1                                              B24A 200
        430  CONTINUE                                                   B24A 201
             GO TO 413                                                  B24A 202
        412  CONTINUE                                                   B24A 203
             IZ=IZ+1                                                    B24A 204
             GO TO 404                                                  B24A 205
        413  IG=IG-1                                                    B24A 206
             J=IS+1                                                     B24A 207
             IF(IG) 414,414,426                                         B24A 208
        414  FAMOA(IS)=AMOA                                             ENTR-MOD
             FAMOB(IS)=AMOB                                             B24A 211
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```
5627            DO 416 I=1,IS                                                   B24A 212
5628            K=-IR(I)                                                        B24A 213
5629            IC(I)=FAMOA(K)                                                  B24A 214
5630          416 IM(I)=FAMOB(K)                                                B24A 215
5631          417  FORMAT(///5X9HELEMENT  ,1844)
5632          418 FORMAT( 5X9HBASE SP   6(4X2A4))                               B24A 219
5633            GO TO 372                                                       B24A 220
5634          369 DO 361 L=1,IS                                                 B24A 221
5635            VNU(II,L)=0.                                                    B24A 223
5636            DO 361 I=1,IS                                                   B24A 224
5637          361 VNU(II,L)=VNU(II,L)+C(I)*UM(L,I)                              B24A 225
5638            LAMI(II)=LAMKK
5639          370 KK=II                                                         B24A 226
5640            II=II+1                                                         B24A 227
5641            YC= 0.                                                          B24A 228
5642          372  READ(KIN,302) (RA(K),RB(KK,K), RC(KK,K), RD(KK,K), RE(KK,K),
5643             1RF(KK,K), ZIGEPS(K), TU(KK,K),KPHA(K),K=1,2)
5644            IF(KPHA(1)-KPHA(2)) 3733,3736,3734
5645          3733 IF(KPHA(1)+KPHA(2)-5) 3734,3737,3734
5646          3734 WRITE(KOUT,3735) AMOA,AMOB
5647          3735 FORMAT(////25H BAD PHASE NUMBERING FOR 2A4)
5648            STOP
5649          3736 IF(KPHA(1)-1) 3734,3727,3728
5650          3737 TU(KK,1)=-TU(KK,1)
5651          3728 FF(KK) = 1.E+10
5652            GG(KK) = 1.E+10
5653            GO TO 3729
5654          3727 FF(KK)=(WT/FITMOL) **FFA
5655            IFMET(KK)=2
5656            GG(KK) = -1.
5657          3729 IF(NFF) 3726,3449,3730
5658          3730 DO 3723 I=1,NFF                                              B24A 233
5659            IF(NFIA(I)-AMOA) 3723,3724,3723                                 B24A 234
5660          3724 IF(NFIB(I)-AMOB) 3723,3720,3723
5661          3720 IF(FFIN(I)-100.) 3725,3731,3731
5662          3725 IF (FFIN(I)) 3480,3480,3481
5663          3480 GG(KK) = -FFIN(I)
5664            IGMET(KK)=1
5665            GO TO 3723
5666          3481 FF(KK) = FFIN(I)
5667            IFMET(KK)=1
5668            GO TO 3723
5669          3731 TF(KK)=FFIN(I)
5670          3723 CONTINUE
5671            IF (GG(KK)) 3449,3449,3455
5672          3449 IF (ZIGEPS(1)-100.) 3453,3452,3452
5673          3453 IF  (ZIGEPS(1)) 3452,3452,3441
5674          3441 IF (ZIGEPS(2)) 3452,3452,3443
5675          3443 GG(KK) = ZIGEPS(1)/SIGMA  *  (ZIGEPS(2)/EPOVRK)**.0795   *
5676             1  (WT/BASMOL)**.25
5677            IGMET(KK)=3
5678            GO TO 3455
5679          3452 IF (KPHA(1)-1)3456,3457,3456
5680          3456 GG(KK) = 1.E+10
5681            GO TO 3455
5682          3457 GG(KK) = (WT/FITGMW)**GGA
5683            IGMET(KK)=2
5684          3455 CONTINUE
```

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5685      3726 IF(KR(3)-6) 3722,3721,3722                                    B24A 243
5686      3721 WRITE(KOUT,306)(ALPT(K),JAT(K), K=1,7), SORCE,AMCA,AMOB
5687           WRITE(KOUT,3020)(RA(K), RB(KK,K), RC(KK,K), RD(KK,K), RE(KK,K),
5688          1RF(KK,K),ZIGEPS(K),TU(KK,K),KPHA(K),K=1,2)
5689      3722 FAMOA(KK)=AMOA                                                B24A 247
5690           FAMOB(KK)=AMOB                                                B24A 248
5691           WTM(KK)=WT                                                    B24A 251
5692           RB(KK,1)= RB(KK,1) + RA(1)
5693           RB(KK,2) = RB(KK,2) + RA(2)
5694           N=N+1                                                         B24A 254
5695           IF(KPHA(1)-1)3734,362,364
5696       364 IFC(KK)=-1                                                    B24A 267
5697           VN(KK)=0.                                                     B24A 268
5698           Y(KK)=YC                                                      B24A 269
5699           IF(TF(KK)-TFMAX) 342,342,371                                  B24A 270
5700       371 TFMAX=TF(KK)                                                  B24A 271
5701           GO TO 342                                                     B24A 272
5702       362 IFC(KK)=0                                                     B24A 273
5703           VN(KK)=VINT                                                   B24A 274
5704           Y(KK)=YINT                                                    B24A 275
5705           GO TO 342                                                     B24A 276
5706      399  WRITE (KOUT,417) (ATA(I),ATB(I),ATC(I),I=1,IS)
5707           WRITE (KOUT,418) (IC(I),IM(I),I=1,IS)
5708      5001 WRITE(KOUT,110) SIGMA,EPOVRK,BASMOL
5709      110  FORMAT(///3X30HMOLECULAR TRANSPORT PROPERTIES/5X75HVISCOSITY .....
5710          1 BUDDENBERG - WILKE MIXTURE FORMULA WITH MU(I) CALCULATED ON/21X34
5711          2HTHE BASIS OF D(I,I) = DBAR/G(I)**2//5X80HTHERMAL CONDUCTIVITY ...
5712          3.. MASON - SAXENA MIXTURE FORMULA WITH EUCKEN CORRECTION//5X73HDIF
5713          4FUSION COEFFICIENTS ..... D(I,J) = DBAR/(F(I)*F(J)) WITH DBAR BASE
5714          5D ON/21X8HSIGMA = ,F8.4,11H, EPOVRK = ,F9.4,13H, AND MREF = ,F8.4)
5715           WRITE (KOUT,111) FITMOL,FFA,FITGMW,GGA
5716      111  FORMAT(///7X16HMETHODS EMPLOYED//8X63HO CONDENSED PHASE, VALUES FOR
5717          1 F(I) AND G(I) SET EQUAL TO 1.E+10//8X42H1 VALUES FOR F(I) (OR G(I
5718          2)) INPUT DIRECTLY//8X71H2 VALUES FOR F(I)   ? G(I)) CALCULATED BY
5719          3 F(I) =(M(I)/FITMOL)**FFA AND/10X65HG(I)     '(I)/FITGMW)**GGA WHER
5720          4E M(I) IS SPECIES MOLECULAR WEIGHT,/10X,S    40L = ,F8.4,12H, AND
5721          5FFA = ,F6.4,11H, FITGMW = F8.4,12H, AND GG  = ,F6.4)
5722           WRITE (KOUT,112)
5723      112  FORMAT(/8X79H3 VALUES FOR G(I) CALCULATED BY G(I) = SQRT(DBAR/D(I,
5724          1I)) = (SIGMA(I)/SIGMA)    /10X73H* (EPS(I)/EPOVRK) **0.0795 * (M(I
5725          2)/MREF) **0.25 WHERE SIGMA(I) AND EPS(I)/10X33HARE GIVEN WITH THER
5726          3MODYNAMIC DATA//7X73HSPECIES   F(I) METHOD G(I) METHOD       SPECI
5727          4ES   F(I) METHOD G(I) METHOD)
5728           WRITE (KOUT,113)((FAMOA(KK),FAMOB(KK),FF(KK),IFMET(KK),GG(KK),IGME
5729          1T(KK)),KK=1,N)
5730      113  FORMAT(7X,2A4,1X,F5.3,3X,I1,3X,F5.3,3X,I1,10X,2A4,1X,F5.3,3X,I1,3X
5731          1,F5.3,3X,I1)
5732           WRITE (KOUT,419)
5733      419  FORMAT (//3X61HSTAGNATION SOLUTION FOLLOWED BY BOUNDARY-LAYER EDGE
5734          1 EXPANSION/)
5735           DO 375 L=1,7
5736           DO 375 I=1,IS                                                 B24A 278
5737           TQ(I,L)=0.                                                    B24A 279
5738           DO 375 K=1,IS                                                 B24A 280
5739       375 TQ(I,L)=TQ(I,L)+UM(I,K)*TK(K,L)                               B24A 281
5740           IF(KR(2)-5) 3752,3752,3751
5741      3751 CONTINUE
5742       240 FORMAT(8F10.6)                                                THER1330
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5743        245 FORMAT (2I3)                                                    THER1340
5744        250 FORMAT(3E10.4)                                                  THER1350
5745        255 READ(KIN,245)MT                                                 THER1370
5746            IF(MT) 3752,3752,256
5747        256 DO 260 M=1,MT                                                   THER1380
5748            READ(KIN,250)FKF(M),EAK(M),EXK(M)                               THER1390
5749            READ(KIN,240)(RMU(I,M),I=1,IS)                                  THER1400
5750        260 READ(KIN,240)(PMU(I,M),I=1,IS)                                  THER1410
5751        265 FORMAT (//3X,7HKINETIC)
5752        270 FORMAT (3X,11HREACTION---,I7,9I10)
5753        275 FORMAT (/3X,8HREACTANT)
5754        280 FORMAT (5X,12HCOEFFICIENTS/)
5755        285 FORMAT (8X,2A4,F8.2,9F10.2)                                     THER1460
5756        290 FORMAT (/3X,7HPRODUCT)
5757        295 FORMAT (/3X,12HPRE-EXPONENT)
5758        200 FORMAT (5X,6HFACTOR,4X,10E10.3)
5759        205 FORMAT (/3X,10HACTIVATION)
5760        210 FORMAT (5X,6HENERGY,4X,10E10.3)
5761        215 FORMAT (/3X,8HREACTION)
5762        220 FORMAT (5X,5HORDER,5X,10E10.3)
5763            WRITE(KOUT,265)
5764            WRITE(KOUT,270)(M,M=1,MT)                                       THER1
5765            WRITE(KOUT,275)
5766            WRITE(KOUT,280)
5767            DO 225 I=1,IS
5768        225 WRITE(KOUT,285)FAMOA(I),FAMOB(I),(RMU(I,M),M=1,MT)
5769            WRITE(KOUT,290)
5770            WRITE(KOUT,280)
5771            DO 230 I=1,IS
5772        230 WRITE(KOUT,285)FAMOA(I),FAMOB(I),(PMU(I,M),M=1,MT)
5773            WRITE(KOUT,295)
5774            WRITE(KOUT,200)(FKF(M),M=1,MT)
5775            WRITE(KOUT,205)
5776            WRITE(KOUT,210)(EAK(M),M=1,MT)
5777            WRITE(KOUT,215)
5778            WRITE(KOUT,220)(EXK(M),M=1,MT)
5779       3752 VN(N+1)=0.
5780            IFC(N+1)=-1
5781            WTM(N+1)=-1.
5782            FAMOA(N+1)=CHAR
5783            FAMOB(N+1)=BLANK
5784            TF(N+1)=50000.
5785            IF(DUB8.GT.0.) TF(N+1) = DUB8
5786            RETURN
5787            END                                                             B24A 283
5788      C825A                                                                 B25A 001
5789            SUBROUTINE PROPS                                                B25A 002
5790            INTEGER FAMOA,FAMOB                                             B25A 004
5791            DIMENSION VK(10),PA(12,12),PV(11,12)                            B25A 005
5792            COMMON /BLQCOM/FAMOA( 71),FAMOB( 71),N    ,FR( 71,15),W(3),LEF(10)B25A   5
5793           1 ,LEFS(10),PIEASE,LEFW(10),L2,L3                                ENTR-MOD
5794            COMMON/EDGCOM/              PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,B25A   7
5795           1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMWE,CGE,C90  ENTR-MOD
5796           2 ,DSIP(40),IDSIP,TTVC,TVCC(40)                                  B25A   9
5797            COMMON /EQPCOM/ RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2),B25A  10
5798           1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),WAT(10),  B25A  11
5799           2 KAT(10),IR(10),IS,KR(10),LAMI( 71),P,T,TK(10, 7),VN( 71),        B25A  12
5800           3 VNU( 71,10),ITFF,KR2,MCH,NCV,WM,WTM( 71),Y( 71),YW( 71),GG( 71)  B25A  13
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5801          4 ,TQ(10, 7),EPOVRK,SIGMA,BASMOL                                  B25A  14
5802           COMMON /EQTCOM/SIP,HIP,EL,ENL,FLIQ,CPF,IRE,IER,AA,ITS,IN,IL,IT,  B25A  15
5803          1 MODE,HMELT,SMELT,TMAX,TMIN,MELT,SUMN,SUML,WS,WSS,B1,ISP2,ISPQ,  B25A  16
5804          2 ISP,KKJ,SVA,SVB,SVC,SVD,SUMC,FFF,CMF,EP,RV,IFCJC,WTG,WTL,JC,MG,  B25A  17
5805          3 CPG,TTMIN,TTMAX,L7,L8,IB(11),EB(10),EBL(10),A(16,16),B(16),      ENTR-MOD
5806          4 IP( 71),ALP(10),FNU(10),GAMM(10),GAMF(10),SLAM(10),DY( 71),RVS,  B25A  19
5807          5 CP( 71),M( 71),SB( 71),TC( 71),VLNK( 71),E( 71),PNUS(10),        B25A  20
5808          6 BC(10),BLNK(10),BY(10),IBC(10),BE(10),JJ( 4)                     B25A  21
5809           COMMON /INTCOM/KKR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,META,II,  B25A  22
5810          1ISS,NS,ITT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL,HITS,KAPPA,CBAR,   B25A  23
5811          2CASE(10),BB(8),  MWE,NON,KD(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,   B25A  24
5812          3 KR9(40),KAUXO,JTIME,JSPEC,MO(3)                                  B25A  25
5813           COMMON /PRPCO /PR(15),TT(15),RHO(15),SC(15),CAPC(15),QR(15),HH(15) B25A  26
5814          1,CPBAR(15),VMW(15),PHIK(15, 8),DRHOH,DRHOK( 8),ZK( 8),DZKH( 8),  DB25A  27
5815          2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8) B25A  28
5816          3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)   B25A  29
5817          4,DPHIKK( 8, 8),      DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL    B25A  30
5818          5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15),  RHOP B25A  31
5819          6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15)   B25A  32
5820           COMMON/WALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPW( 8,40, 1)         B25A  33
5821          1,RHOVW(40, 1),FLUXJ( 3,48, 1),IHW,ITW,IFW,ISPW,IRHOVW,IFLUXJ      B25A  34
5822           DIMENSION PRP(1)
5823           EQUIVALENCE (PRP(1),PV(1))
5824           IF(II-1) 310,300,310                                              B25A 032
5825      300  IF(KKR(14)-10) 310,302,302                                        B25A 033
5826      302  KKR(14)=KKR(14)-10                                                B25A 034
5827      310  IF(T-300.001) 312,312,320                                         B25A 035
5828      312  KKR(14)=KKR(14)+10                                                B25A 036
5829      320  HM=AA/P
5830           ISV=IS                                                            B25A 038
5831           IS=NSP                                                            B25A 039
5832           ISVP=ISV+1                                                        B25A 040
5833      543  ISV2=ISV+2
5834           CT=-0.5                                                           B25A 041
5835           ISM=IS-1                                                          B25A 042
5836           ISP=IS+1                                                          B25A 043
5837           ISP2=IS+2                                                         B25A 044
5838           TT(II)=T*1.8                                                      B25A 046
5839           RHO(II)=AA/(1.3146*T)
5840           CTR=CT*1.9876                                                     B25A 049
5841      C    FORM NECESSARY SUMMATIONS                                         B25A 051
5842           PMU2=0.                                                           B25A 052
5843           CPTIL=0.                                                          B25A 053
5844           WTG=0.
5845           MG=0.
5846           CPG=0.
5847           HTIL=0.                                                           B25A 054
5848           PMU1=0.                                                           B25A 055
5849           TMU3=0.                                                           B25A 056
5850           I=1
5851           DO 451 IK=1,N
5852           IF(KAT(ISV)-99) 544,541,544                                       ENTR-MOD
5853      541  IF(IK-ISV) 544,451,542
5854      542  H(I)=H(I)-VMU(I,ISV)*H(ISV)
5855           WTM(I)=WTM(I)-VMU(I,ISV)*WTM(ISV)
5856           CP(I)=CP(I)-VMU(I,ISV)*CP(ISV)
5857      544  IF(IFC(I)) 451,4550,451
5858     4550  PMU1=PMU1+VM(I)*FF(I)                                             B25A 060
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5859       451 I=I+1
5860           VMU1=PMU1/P                                              B25A 062
5861           AMU5=0.                                                  B25A 063
5862           PMU6=0.                                                  B25A 064
5863           WDZ=1.385                                                B25A 065
5864           WD4 = 0.284*WDZ
5865           I = 1
5866           DO 454 IK = 1,N
5867           IF(IK-IS) 4510,4510,4509                                 ENTR-MOD
5868      4510 VK(I)=0.                                                 ENTR-MOD
5869           ZK(I)=0.                                                 ENTR-MOD
5870      4509 IF(IFC(I).NE.0) GO TO 454                                ENTR-MOD
5871           ASTAR = 1.13 * GG(I)/FF(I) * GG(I)/FF(I)
5872           WD2=1.2*ASTAR/PMU1
5873           WD7=WDZ/PMU1-WD2
5874           WD5=.32*ASTAR/PMU1
5875           WD8=WD4/PMU1-WD5
5876           VA=VN(I)/FF(I)                                           B25A 074
5877           VB=VA*WTM(I)                                             B25A 075
5878           VC=VN(I)*FF(I)                                           B25A 076
5879           IF(IK-IS) 4511,4511,4560                                 ENTR-MOD
5880      4511 VK(I)=VN(I)                                              B25A 081
5881       452 ZK(I)=VA                                                 B25A 082
5882           GO TO 457                                                B25A 083
5883      4560 IF(IK-ISV) 4562,4552,456                                 ENTR-MOD
5884      4562 IF(KAT(I).NE.99) GO TO 457                               ENTR-MOD
5885           WTM(I)=0.                                                ENTR-MOD
5886           CP(I)=0.
5887           H(I)=0.
5888           GO TO 454
5889       456 DO 453 K=1,ISM                                           ENTR-MOD
5890           VK(K)=VK(K)+VN(I)*VMU(I,K)                               B25A 087
5891       453 ZK(K)=ZK(K)+VA*VMU(I,K)                                  B25A 088
5892       457 PMU2=PMU2+VB                                             B25A 089
5893           TMU3=TMU3+VA                                             B25A 090
5894           CPTIL=VA*CP(I)+CPTIL                                     B25A 091
5895           HTIL=HTIL+VA*H(I)                                        B25A 092
5896           WTG=WTG+VN(I)*WTM(I)
5897           HG=HG+VN(I)*H(I)
5898           CPG=CPG+VN(I)*CP(I)
5899           AMU5=AMU5+VB/(WDZ-VC*WD7)
5900           PMU6=PMU6+VA/(WD4-VC*WD8)
5901       454 I=I+1
5902           VMU5=AMU5/WTG
5903           VMU6=(PMU6  +CPTIL/1.9869-2.5*TMU3)/P                    B25A 097
5904           VMU2=PMU2/P                                              B25A 098
5905           VMU3=TMU3/PMU2                                           B25A 099
5906           CPTIL = CPTIL / PMU2                                     PROP1110
5907           HTIL = HTIL / PMU2 * 1.8                                 PROP1120
5908           HG=HG/WTG
5909           CPG=CPG/WTG
5910           WM=WTG/P
5911           ZKS = 1.0                                                PROP1020
5912           VKS=1.0
5913           DO 95 K=1,ISM                                            PROP1030
5914           VK(K)=VK(K)/WTG*WTM(K)
5915        95 ZK(K) = ZK(K) / PMU2 * WTM(K)                            PROP1050
5916           OMEGA=1.07/(T/EPOVRK) **0.159
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5917          OBAR = 2.82861E-6/(SIGMA * SIGMA) *T/P*SQRT(T/BASMOL)/OMEGA
5918          VMU(II)=RHO(II)*OBAR *VMU5/VMU1                                  B25A 107
5919          IF(KR(5)) 461,461,460                                            B25A 108
5920     460  RHOE(ISS)=RHO(II)                                                B25A 109
5921          VMUE(ISS)=VMU (II)                                               B25A 110
5922          VMME=MM                                                          B25A 111
5923          IS=ISV                                                           B25A 112
5924          RETURN                                                           B25A 113
5925     461  CONTINUE                                                         B25A 114
5926          CAPC(II)=RHO(II)/RHOE(ISS)*VMU(II)/VMUE(ISS)                     B25A 115
5927          VMX(II)=MM                                                       B25A 116
5928          VLAM=RHO(II)*OBAR/MM*VMU6/VMU1*1.9869                            B25A 117
5929          SC(II)=VMU5/VMU2*MM                                              B25A 118
5930          IF (KKR(14)-1) 4613,4612,4611                                    B25A 122
5931     4611 FFK2=MM/VMU2                                                     B25A 123
5932          VMU1=FFK2                                                        B25A 124
5933          VMU3=1./MM                                                       B25A 125
5934          CPTIL=CPG
5935          HTIL=HG*1.8
5936          DO 4614 K=1,ISM                                                  B25A 128
5937     4614 ZK(K)=VK(K)                                                      B25A 129
5938     4612 CT=0.                                                            B25A 130
5939          CTR=0.                                                           B25A 131
5940     4613 VMU12=VMU1*VMU2                                                  B25A 132
5941          IF(KKR(20)) 9004,9005,9004                                       B25A 133
5942     9004 WRITE(KOUT,9006)OMEGA,OBAR,     VLAM,SC(II),FR(II),VMU1,VMU2,VMU3,T B25A 134
5943         1T(II),VMU5,VMU6,FF(1),FF(2),FF(3),CPTIL,HTIL,(VK (I),WTM(I),ZK(I), B25A 135
5944         2I=1,ISM),VMU(II)                                                B25A 13
5945     9005 CONTINUE                                                         B25A 137
5946          IF(KR(6)) 5000,5340,5340                                         B25A 139
5947     5000 CPBAR(II)=CPG
5948          PR(II)=CPG/VMU6*VMU5/1.9869*MM
5949          NPR=ISP2
5950          DO 501 I=1,NPR
5951          DO 501 J=1,ISV2
5952      501 PA(I,J)=0.                                                       B25A 142
5953          PA(3,1)=PMU2*CPTIL*T                                             B25A 143
5954          DO 502 K=3,ISV2                                                  ENTR-MOD
5955          IF (KKR(14)-1) 5015,5016,5017                                    B25A 145
5956     5016 FFK2=FF(K-2)                                                     B25A 146
5957     5017 IF(IFC(K-2)) 502,5011,5014                                       ENTR-MOD
5958     5011 PA(1,K)=VN(K-2)/FFK2                                             B25A 148
5959          GO TO 5013                                                       B25A 149
5960     5014 PA(1,K)=1./FFK2
5961     5013 PA(2,K)=PA(1,K)*WTM(K-2)                                         B25A 154
5962          PA(3,K)=PA(1,K)*H(K-2)                                           B25A 155
5963          IF(K-ISP)5018,5018,5019
5964     5018 PA(K+1,K)=PA(1,K)
5965     5019 CONTINUE
5966      502 CONTINUE                                                         B25A 157
5967          J=ISVP
5968          IF(ISVP.GT.M) GO TO 5878
5969          DO 507 IJ=ISVP,M
5970          IF(IFC(J)) 507,5021,507                                          B25A 159
5971     5021 PRP(1)=VN(J)/FFK2
5972          IF (KKR(14)-1) 5022,5022,5023                                    B25A 161
5973     5022 PRP(1)=VN(J)/FF(J)
5974     5323 PRP(2)=PRP(1)*WTM(J)
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5975            PRP(3)=PRP(1)*H(J)
5976            DO 5024 I=4,ISP2
5977         5024 PRP(I)=PRP(1)*VNU(J,I-3)
5978            DO 505 I=1,NPR
5979            PA(I,1)=PA(I,1)-TC(J)*PRP(I)
5980            DO 505 K=1,ISV
5981            IF(IFC(K)) 506,506,505
5982          506 PA(I,K+2)=PA(I,K+2)+PRP(I)*VNU(J,K)
5983          505 CONTINUE
5984          507 J=J+1
5985         5070 VA=AA/WTM(IS)
5986            DO 511 I=1,ISV2
5987            A(I,1)=A(I,1)*AA/1.8                                    B25A 182
5988          511 A(I,ISP2)=A(I,ISP2)*VA                                B25A 183
5989            DO 512 J=3,ISP                                          B25A 184
5990            VA=AA/WTM(J-2)                                          B25A 185
5991            DO 512 I=1,ISV2
5992          512 A(I,J)=A(I,J)*VA-A(I,ISP2)                            B25A 187
5993        C   FORM PA,A PRODUCT AND TRANSPOSE (TO ESTABLISH EQUIVALENCE B25A 188
5994            DO 521 I=1,NPR
5995            DO 521 J=1,ISP                                          B25A 190
5996            PV(J,I)=PA(I,1)*A(1,J)                                  B25A 191
5997            DO 521 L=3,ISV2
5998          521 PV(J,I)=PV(J,I)+PA(I,L)*A(L,J)                        B25A 193
5999            DO 533 K=1,ISP                                          B25A 194
6000            PV(K,1)=(PV(K,1)-VNU3*PV(K,2))/PNU2                     B25A 195
6001            PV(K,3)=(PV(K,3)*1.8-HTIL*PV(K,2))/PNU2                 B25A 196
6002            DO 531 J=1,ISM                                          B25A 197
6003          531 PV(K,J+3)=(PV(K,J+3)*WTM(J)-ZK(J)*PV(K,2))/PNU2       B25A 198
6004          533 PV(K,2)=CT*A(1,K)+PV(K,2)/PNU2                        B25A 199
6005            PV(2,2)=PV(2,2)-1./P                                    B25A 200
6006        C   POOR MAN-S EQUIVALENCE                                  B25A 201
6007            QR(II)=0.                                               B25A 202
6008            DCAPCH=CAPC(II)*(2.*A(2,1)-0.341*A(1,1))                B25A 203
6009            DPRH=0.                                                 B25A 204
6010            DSCH=0.                                                 B25A 205
6011            DQRH=0.                                                 B25A 206
6012            DCP8H=0.                                                B25A 207
6013            DCPTH=0.                                                B25A 208
6014            DMU12H=0.                                               B25A 209
6015            DRHOH=RHO(II)*(A(2,1)-A(1,1))                           B25A 210
6016            DTH=T*A(1,1)*1.8                                        B25A 211
6017            DMU3H=PV(1,1)                                           B25A 212
6018            DMU4H=PV(1,2)                                           B25A 213
6019            DHTILH=PV(1,3)                                          B25A 214
6020            IF (NSPM1)5340,5340,5320
6021         5320 DO 534 K=1,ISM
6022            PHIK(II,K)=0.                                           B25A 216
6023            DPHIKH(K)=0.                                            B25A 217
6024            DRHOK(K)=RHO(II)*(A(2,K+2)-A(1,K+2))                    B25A 218
6025            DPRK(K)=0.                                              B25A 219
6026            DSCK(K)=0.                                              B25A 220
6027            DTK(K)=T*A(1,K+2)*1.8                                   B25A 221
6028            DCAPCK(K)=CAPC(II)*(2.*A(2,K+2)-0.341*A(1,K+2))         B25A 222
6029            DQRK(K)=0.                                              B25A 223
6030            DCP8K(K)=0.                                             B25A 224
6031            DCPTK(K)=0.                                             B25A 225
6032            DMU12K(K)=0.                                            B25A 226
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6033            DMU3K(K)=PV(K+2,1)                                              B25A 227
6034            DMU4K(K)=PV(K+2,2)                                              B25A 228
6035            DHTILK(K)=PV(K+2,3)                                             B25A 229
6036            DZKH(K)=PV(1,K+3)                                               B25A 230
6037            DO 532 I=1,ISM                                                  B25A 231
6038            DPHIKK(I,K)=0.                                                  B25A 232
6039          532 DZKK(I,K)=PV(K+2,I+3)                                         B25A 233
6040          534 CONTINUE                                                      B25A 234
6041         5340 LIM=N+KR(8)
6042            DO 535 I=1,LIM
6043            IF(KR(6)) 5343,5344,5344
6044         5343 IF(MOD(IFC(I),3)) 535,5344,535
6045         5344 FR(I,II)=VN(I)/P
6046            IF(VN(I)) 5341,5341,535                                         B25A 237
6047         5341 IF(IFC(I)) 535,5342,535                                       B25A 238
6048         5342 FR(I,II)=1.E-30                                               B25A 239
6049          535 CONTINUE                                                      B25A 240
6050            IF(KR(6)) 538,538,5350
6051         5350 IF (KR(1)-1) 536,5361,5360
6052         5361 Y(JC)=0.
6053          536 HN(ISS,ITT)=HG*1.8
6054         5360 DO 537 K=2,IS
6055          537 SPH(K-1,ISS,ITT)=VK(K-1)                                      B25A 244
6056            RHOVN(ISS,ITT)=-RV
6057          538 CONTINUE                                                      B25A 246
6058            IF(IKR(20)) 9001,9002,9001                                      B25A 247
6059         9001 WRITE(KOUT,9006)DMU3M,DMU3K,DMU4M,DMU4K,DHTILM,DHTILK,DTM,DTK,DRHO B25A 248
6060           1M,DRHOK,DZKH,DZKK,HG,VK
6061         9002 CONTINUE                                                      B25A 250
6062            IS=ISV                                                          B25A 251
6063         9006 FORMAT(/(1X1P10E12.5))
6064            ISP=ISVP
6065            ISP2=IS+2
6066            IF(II-1) 551,539,551
6067          539 DO 540 I=1,IS
6068          540 YU(I)=Y(I)
6069          551 RETURN
6070            END                                                             B25A 253
6071       CB26A                                                                B26A 001
6072            SUBROUTINE TAYLOR (D,FN,F,P)                                    B26A 002
6073            DIMENSION FN(1),F(1),P(1)                                       B26A 003
6074            COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,META,I   B26A 004
6075            D2=D*D                                                          B26A 005
6076            IF(KR(18)-1) 1,2,4
6077          2 IF(I-META) 4,1,4
6078          4 FD=0.
6079            P(1)=(((FN(3)/6.-FD/24.)*D-F(2)/2.)*D+F(1))*D                   B26A 009
6080            P(2)=(((FD/30.-FN(3)/8.)*D+F(2)/3.)*D-F(1)/2.)*D2               B26A 010
6081            P(3)=0.                                                         B26A 011
6082            P(4)=(((FN(3)/20.-FD/72.)*D-F(2)/8.)*D+F(1)/6.)*D2*D-P(3)       B26A 012
6083            GO TO 3                                                         B26A 013
6084          1 FD=F(3)-FN(3)                                                   B26A 014
6085            P(1)=(((F(3)/6.-FD/24.)*D-F(2)/2.)*D+F(1))*D                    B26A 015
6086            P(2)=(((FD/30.-F(3)/8.)*D+F(2)/3.)*D-F(1)/2.)*D2                B26A 016
6087            P(4)=-(((FD/252.-F(3)/72.)*D+F(2)/30.)*D-F(1)/24.)*D2*D         B26A 017
6088            P(3)=(((F(3)/20.-FD/72.)*D-F(2)/8.)*D+F(1)/6.)*D2*D-P(4)        B26A 018
6089          3 CONTINUE                                                        B26A 019
6090            RETURN                                                          B26A 020
```

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      END                                                                B26A 021
C B27A                                                                   B27A 001
      SUBROUTINE LINMAT                                                  B27A 002
      COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)       B27A   3
     1,LAR(153),BA1(43,18),BA2(30,15)                                    B27A   4
      COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB27A   5
     1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B27A   6
     2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B27A   7
     3,KAUXC,JTIME,JSPEC,MD(3)                                           B27A   8
      DO 104 I=2,NETA                                                    B27A 008
      DETA(I-1)=ETA(I)-ETA(I-1)                                          B27A 009
      DSQ(I-1)=DETA(I-1)*DETA(I-1)                                       B27A 010
      B1(I-1)=B(3)*DSQ(I-1)                                              B27A 011
      B2(I-1)=2.*B1(I-1)                                                 B27A 012
  104 DCU(I-1)=DETA(I-1)*DSQ(I-1)                                        B27A 013
      MAT1I=3*NETA-2                                                     B27A 014
      MAT2I=2 * NETA
      MAT1J= NETA+3
      MAT2J= NETA
      DO 108 I=1,MAT2I
      DO 108 J=1,MAT2J
  108 BA2(I,J)=0.
      DO 105 I=1,MAT1I                                                   B27A 017
      DO 105 J=1,MAT1J                                                   B27A 018
  105 BA1(I,J)=0.                                                        B27A 019
      BA1(1,2)=1.                                                        B27A 020
      BA1(1,3)= DSQ(1)/2.
      BA1(NETA,3) = DETA(1)
      BA1(MAT2I-1,3)=1.
      BA2(2,1)=DETA(1)
      BA2(NETA+1,1)=1.
      J=NETA
      DO 106 I=2,NETA                                                    B27A 022
      BA1(I-1,I+2)=DETA(I-1)
      BA1(J,I+2)=1.
      BA1(J,I+3)=-1.
      BA2(I,I)=1.
      IF(I-NETA) 103,106,106
  103 BA2(I,I+1)=-1.
  106 J=J+1
 9060 FORMAT(2X1P12E10.3)                                                B27A 031
 9064 FORMAT(2X37HLINEAR MATRIX FOR MOMENTUM EQUATIONS,I3,2H XI3,        B27A 032
     127H, BEFORE AND AFTER SOLUTION)                                    B27A 033
 9079 FORMAT(2X44HLINEAR MATRIX FOR MASS AND ENERGY EQUATIONS,I3,2H XI3,B27A 034
     127H, BEFORE AND AFTER SOLUTION)                                    B27A 035
      IF(KR(15)-1) 9062,9062,9061                                        B27A 036
 9061 WRITE(KOUT,9064) MAT1I,MAT1J                                       B27A 037
      DO 9063 I=1,MAT1I                                                  B27A 038
 9063 WRITE(KOUT,9060)(BA1(I,J),J=1,MAT1J)                               B27A 039
 9062 DO 107 LI=2,MAT1J
  107 CALL MATS1(BA1(1,LI))
      IF(KR(15)-1) 9069,9069,9066                                        B27A 055
 9066 DO 9067 I=1,MAT1I                                                  B27A 056
 9067 WRITE(KOUT,9060)(BA1(I,J),J=1,MAT1J)                               B27A 057
      WRITE(KOUT,9079) MAT2I,MAT2J                                       B27A 058
      DO 9068 I=1,MAT2I                                                  B27A 059
 9068 WRITE(KOUT,9060)(BA2(I,J),J=1,MAT2J)                               B27A 060
 9069 DO 110 LI=1,MAT2J
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```
      110 CALL MATS2(BA2(1,LI))
          IF(KR(15)-1) 9072,9072,9071                                    B27A 063
     9071 DO 9073 I=1,MAT2I                                              B27A 064
     9073 WRITE(KOUT,9060)(BA2(I,J),J=1,MAT2J)                           B27A 065
     9072 NLEQ=MAT1I+NSP*MAT2I                                           B27A 066
          NNLEQ=MAT1J+NSP*MAT2J                                          B27A 067
          NAM=NNLEQ-(NSPM1+2)                                            B27A 068
          NRNL=NSP+1                                                     B27A 069
          LAR(NAM+1)=2
          J=2+MAT1J
          LL=NAM+2
          DO 111 L=LL,NNLEQ
          LAR(L)=J
      111 J=J+MAT2J
          L=NAM+1
          J=0
          DO 113 I=1,NAM
          J=J+1
          IF(LAR(L)-J) 113,112,113
      112 L=L+1
          J=J+1
      113 LAR(I)=J
          IF(KR(15)) 9901,9902,9901                                      B27A 085
     9901 CONTINUE                                                       B27A 086
     9999 FORMAT(2X16HDEBUG LAR INDICE/(8X20I4))                         B27A 087
          WRITE(KOUT,9999) LAR                                           B27A 088
     9902 CONTINUE                                                       B27A 089
          RETURN                                                         B27A 090
          END                                                            B27A 091
C B28A
          SUBROUTINEKINET                                                KINE0010
          COMMON /HISCOM/ C1,C2,C3
          COMMON /BUMCOM/ BUMP,CORMA,EASE
          COMMON/INTCOM/KKR(20),KIN,KOUT
          DIMENSION ELKM(10),DELK(10)                                    B28A 004
          COMMON /EQPCOM/ RB( 71,2),RC( 71,2),RD( 71,2),RE( 71,2),RF( 71,2),B28A   5
         1 TU( 71,2),FF( 71),FFA,IFC( 71),ATA(10),ATB(10),ATC(10),WAT(10),  B28A   6
         2 KAT(10),IR(10),IS,KR(10),LAMI( 71),P,T,TK(10, 7),VN( 71),        B28A   7
         3 VNU( 71,10),ITFF,KR2,HCH,NCV,WM,WTM( 71),Y( 71),YH( 71),GG( 71)  B28A   8
         4 ,TQ(10, 7),EPOVRK,SIGMA,BASMOL                                   B28A   9
          COMMON /EQTCOM/SIP,HIP,EL,ENL,FLIQ,CPF,IRE,IER,AA,ITS,IN,IL,IT,   B28A  10
         1 MODE,HMELT,SMELT,TMAX,TMIN,MELT,SUMN,SUML,WS,WSS,B1,ISP2,ISPQ,   B28A  11
         2 ISP,KKJ,SVA,SVB,SVC,SVD,SUMC,FFF,CNF,EP,RV,IFCJC,WTG,WTL,JC,HG,  B28A  12
         3 CPG,TTMIN,TTMAX,L2,L3,IB(11),EB(10),EBL(10),A(16,16),B(16),      B28A  13
         4 IP( 71),ALP(10),FNU(10),GAMH(10),GAMF(10),SLAM(10),DY( 71),RVS,  B28A  14
         5 CP( 71),H( 71),SB( 71),TC( 71),VLNK( 71),E( 71),PNUS(10),        B28A  15
         6 BC(10),BLNK(10),CY(10),IBC(10),BE(10),JJ( 4)                     B28A  16
          COMMON/KINCOM/MT,FKF(10),EAK(10),EXK(10),PMU(10,10),RMU(10,10),   B28A  17
         1 DKPT(10),PKP(10),PKR(10),RAT(10),RSIG(10),PA(10),LL(10),PMR(10), B28A  18
         2 PRMU(10,10),EESE(10)                                             B28A  19
         5 FORMAT(13I3)                                                     KINE0320
        10 RT = 1.9869 * T                                                  KINE0330
          DO 40 M=1,MT                                                      KINE0340
          SUMD = 0.                                                         KINE0350
          SUMK = 0.                                                         KINE0360
          SUMR = 0.                                                         KINE0370
          SUMP = 0.                                                         KINE0380
          DO 15 I=1,IS                                                      KINE0390
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```
6207            PRMU(I,M) = PMU(I,M) - RMU(I,M)                                 KINE0400
6208            SUMK = SUMK + PRMU(I,M) * VLNK(I)                               KINE0410
6209            SUMR = SUMR + RMU(I,M) * Y(I)                                   KINE0420
6210            SUMP = SUMP + PMU(I,M) * Y(I)                                   KINE0430
6211         15 SUMD = SUMD + PRMU(I,M) * H(I)                                  KINE0440
6212      C     EQUILIBRIUM CONSTANTS FOR KINETIC REACTIONS IN TERMS OF BASE SPECIKINE0450
6213      C          LOG KP-S                                                   KINE0460
6214      C     DERIVATIVES OF LOGS OF ABOVE KP-S WITH RESPECT TO LOG T          KINE0480
6215            DKPT(M) = SUMD / RT                                             KINE0490
6216      C     RIGHT HAND SIDE (OR REVERSE PART) OF DRIVING POTENTIAL           KINE0500
6217            IF(ITS  ) 19,14,16
6218         14 DELK(M)=0.
6219         16 IF(DELK(M)) 17,19,18
6220         17 SUMP=SUMP-DELK(M)
6221            GO TO 19
6222         18 SUMR=SUMR+DELK(M)
6223         19 ELKM(M)=SUMP-SUMK-SUMR
6224            PKP(M) = EXP(SUMP - SUMK)                                       KINE0510
6225      C     LEFT HAND SIDE (OR FORWARD PART) OF DRIVING POTENTIAL            KINE0520
6226            PKR(M) = EXP(SUMR)                                              KINE0530
6227            VK1 = PKR(M) - PKP(M)                                           KINE0540
6228            IF (VK1) 25,20,25                                               KINE0550
6229         20 VK1 = 1.E - 9 * PKR(M)                                          KINE0560
6230         25 CONTINUE
6231            VK2 = AA * FKF(M) * (ABS(VK1)) * * (EXK(M) - 1.) * EXP( - EAK(M) /KINE0580
6232           1 RT)*(-C3)
6233            VK3 = VK2                                                       KINE0600
6234            IF (EXK(M) - 1.) 35,30,30                                       KINE0610
6235         30 VK3 = VK2 * EXK(M)                                              KINE0620
6236      C     PM TIMES FORWARD RATE OF REACION I  (PM=AA)                      KINE0630
6237         35 PMR(M) = VK2 * VK1                                              KINE0640
6238            PKP(M) = PKP(M) * VK3                                           KINE0650
6239            PKR(M) = PKR(M) * VK3                                           KINE0660
6240            RAT(M)=AMAX1(ABS(PKP(M)),ABS(PKR(M)))
6241            RSIG(M)=RAT(M)
6242            IF(KR(7)-1) 40,40,36
6243         36 IF(M-1) 37,37,39
6244         37 WRITE(KOUT,38)
6245         38 FORMAT(2X1HM7X3HLKP6X8HDLKP/DLT6X4HPMRR8X4HPMRP9X3HPMR9X3HRAT)
6246         39 WRITE(KOUT,41) M,SUMK,DKPT(M),PKR(M),PKP(M),PMR(M),RAT(M)
6247           1 ,ELKM(M),DELK(M)
6248         40 CONTINUE
6249         41 FORMAT(I3,2X8E12.5)
6250         45 FORMAT(1X26HA(I,J),B(I),I=1,8,J=1,8 IN)                         KINE0690
6251         50 FORMAT(1X12E10.3)                                               KINE0700
6252         55 FORMAT(1X27HA(I,J),B(I),I=1,8,J=1,8 OUT)                        KINE0710
6253            IF (KR(7) - 1) 80,80,65                                         KINE0730
6254         65 CONTINUE
6255            WRITE(KOUT,50)PRMU                                              KINE0810
6256            WRITE(KOUT,215)                                                 KINE0820
6257            WRITE(KOUT,50)(EB(I),I=1,IS)                                    KINE0830
6258            WRITE(KOUT,50)(E(I),I=1,IS)
6259         70 WRITE(KOUT,45)                                                  KINE0840
6260            DO 75 I=1,ISP2                                                  KINE0850
6261         75 WRITE(KOUT,50)(A(I,J),J=1,ISPQ),B(I)
6262         80 CONTINUE                                                        KINE0870
6263            IF(ITS) 105,85,105
6264      C*****ORDER REACTIONS                                                 KINE0880
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```
6265        85 DO 86 M=1,MT
6266        86 MA(M)=M
6267           IF(MT-1) 105,105,90                                    KINE0900
6268        90 K = 0                                                  KINE0910
6269           DO 100 M=2,MT
6270           IF(RSIG(M)-RSIG(M-1)) 100,100,95                       KINE0930
6271        95 K = MA(M)                                              KINE0940
6272           MA(M) = MA(M - 1)                                      KINE0950
6273           MA(M - 1) = K
6274           DUM1=RSIG(M)
6275           RSIG(M)=RSIG(M-1)
6276           RSIG(M-1)=DUM1
6277       100 CONTINUE                                               KINE0990
6278           IF (K) 105,105,85                                      KINE1000
6279     C*****START SECOND MAJOR LOOP ON REACTIONS                   KINE1010
6280       105 DO 200 MM=1,MT
6281           RSIG(MM)=0.
6282           M = MA(MM)                                             KINE1030
6283     C*****IS IT A CONTROLLING REACTION                           KINE1040
6284           IF(ITS) 106,108,106
6285       106 L=LL(MM)
6286           IF(L) 126,126,107
6287       107 DUM=ABS(PRMU(L,M)*RAT(M))
6288           GO TO 130
6289       108 LL(MM)=0                                               KINE1060
6290           DO 125 L=1,IS                                          KINE1070
6291           IF (PRMU(L,M)) 110,125,110                             KINE1080
6292       110 DO 115 K=1,MM                                          KINE1090
6293           IF (L - LL(K)) 115,125,115                             KINE1100
6294       115 CONTINUE
6295           DUM=ABS(PRMU(L,M)*RAT(M))
6296           IF(ABS(PRMU(L,M))-.001) 125,125,120
6297     C* * * YES,IT IS FOR MASS BALANCE L                          KINE1120
6298       120 LL(MM) = L                                             KINE1130
6299           GOTO 130                                               KINE1140
6300       125 CONTINUE                                               KINE1150
6301     C* * *NO, IT IS NOT, ADD INTO ALL MASS BALANCES               KINE1160
6302       126 I1=1
6303           I2 = IS                                                KINE1180
6304           GOTO 170                                               KINE1190
6305     C*****REARRANGE ACCORDING TO CONTROLLING REACTION             KINE1200
6306       130 RSIG(MM)=DUM/EB(L)*0.1
6307           DUM1=PRMU(L,M)
6308           PRMU(L,M) = 0.                                         KINE1220
6309           DO 165 I=1,IS                                          KINE1230
6310           IF (PRMU(I,M)) 135,165,135                             KINE1240
6311       135 DUM2 = PRMU(I,M) / DUM1                                KINE1250
6312           IP(1)=1
6313           MP = MM + 1                                            KINE1260
6314           IF (MT - MP) 155,140,140                               KINE1270
6315       140 DO 150 K=MP,MT                                         KINE1280
6316           MI = MA(K)                                             KINE1290
6317           PRMU(I,MI) = PRMU(I,MI) - DUM2 * PRMU(L,MI)            KINE1300
6318           IF (ABS(PRMU(I,MI)) - .001) 145,150,150                KINE1310
6319       145 PRMU(I,MI) = 0.                                        KINE1320
6320       150 CONTINUE                                               KINE1330
6321       155 DO 160 K=1,ISPQ                                        KINE1340
6322       160 A(I + 2,K) = A(I + 2,K) - DUM2 * A(L + 2,K)            KINE1350
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```
6323          B(I + 2) = B(I + 2) - DUM2 * B(L + 2)                          KINE1360
6324          E(I)=E(I)-DUM2*E(L)
6325          DUM2 = ABS(DUM2)                                               KINE1370
6326          EB(I) = AMAX1(EB(I) ,DUM2 * EB(L))                             KINE1380
6327        165 CONTINUE                                                     KINE1390
6328          PRMU(L,M) = DUM1                                               KINE1400
6329      C*****ADD CONTROLLING REACTION INTO ITS MASS BALANCE               KINE1410
6330          I1 = L                                                         KINE1420
6331          I2 = L                                                         KINE1430
6332          EOL=E(L)+PMR(M)*PRMU(L,M)
6333          IF(ITS) 170,230,170
6334        230 DELK(M)=(1.-EASE)*ELKM(M)*AMIN1(1.,ABS(EOL/EB(L)))
6335          ELKM(M)=ELKM(M)-DELK(M)
6336          IF(PKR(M)-PKP(M)) 240,170,235
6337        235 PKP(M)=PKP(M)*EXP(-DELK(M))
6338          GO TO 245
6339        240 PKR(M)=PKR(M)*EXP(DELK(M))
6340        245 PMR(M)=PKR(M)-PKP(M)
6341        170 DO 176 J=1,IS
6342          IF(IFC(J)) 171,171,176
6343        171 SUMD = RMU(J,M) * PKR(M) - FMU(J,M) * PKP(M)                 KINE1450
6344          DO 175 I=I1,I2                                                 KINE1460
6345        175 A(I + 2,J + 2) = A(I + 2,J + 2) - SUMD * PRMU(I,M)           KINE1470
6346        176 CONTINUE
6347          SUMD = - PKP(M) * DKPT(M) - EAK(M) / RT * PMR(M)               KINE1480
6348          DO 180 I=I1,I2                                                 KINE1490
6349          DUM1 = PMR(M) * PRMU(I,M)                                      KINE1500
6350          A(I+2,2)=A(I+2,2)-DUM1
6351          A(I + 2,1) = A(I + 2,1) + SUMD * PRMU(I,M)                     KINE1510
6352          E(I)=E(I)+DUM1
6353          B(I + 2) = B(I + 2) + DUM1                                     KINE1520
6354        180 EB(I) = AMAX1(EB(I) ,ABS(PRMU(I,M) * RAT(M)))
6355          EB(I) =AMAX1(EB(I),ABS(E(I)))
6356          IF (KR(7) - 1) 200,200,185                                     KINE1540
6357        185 WRITE(KOUT,215)                                              KINE1550
6358          WRITE(KOUT,50)(EB(I),I=1,IS)                                   KINE1560
6359          WRITE(KOUT,50)(E(I),I=1,IS)
6360        190 WRITE(KOUT,55)                                               KINE1570
6361          DO 195 I=1,ISP2                                                KINE1580
6362          WRITE(KOUT,50)(A(I,J),J=1,ISPQ),B(I)
6363        195 CONTINUE                                                     KINE1600
6364          WRITE(KOUT,5)M,I1,I2,L,LL,MM,MA                                KINE1610
6365          WRITE(KOUT,50)PRMU                                             KINE1620
6366        200 CONTINUE                                                     KINE1630
6367      C*****MODIFY COEFFICIENTS TO ACHIEVE LINEARITY AS EQUIL IS APPROACHED
6368          DO 206 MM=1,MT
6369          L=LL(MM)
6370          IF(L) 201,206,201
6371        201 M=MA(MM)
6372          DUM2=RSIG(MM)
6373          IF(ITS) 250,248,250
6374        248 EESE(L)=E(L)*(1.-EASE)/(1.+DUM2)
6375        250 E(L)=E(L)-EESE(L)
6376          B(L+2)=B(L+2)-EESE(L)
6377          EB(L)=-EB(L)
6378          AR=1.
6379          EXEL=PKR(M)/PKP(M)
6380          IF(EXEL) 191,191,193
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      191 EXEL=1.E-35
          IF(PKP(M)-PKR(M)) 192,193,193
      192 EXEL=1.E+35
      193 CONTINUE
          EOL=E(L)*DUM2/(DUM2+1.)
          DUM1=(1.+DUM2)/(1.+RSIG(MM))
          EB(L)=EB(L)*ABS(DUM1)
          IF(ABS(EXEL-1.)-.1) 204,204,202
      202 DUM1=E(L)/(ELKM(M)*PRMU(L,M))
          AR=(DUM1+PKR(M))/PMR(M)
          AR=AMAX1(AR,0.)
          AR=AMIN1(1.,AR)
      204 DO 205 J=1,IS
          IF(IFC(J)) 203,203,205
      203 A(L+2,J+2)=A(L+2,J+2)+ EOL*(PMU(J,M)*(1.-AR)+AR*RMU(J,M))
      205 CONTINUE
          A(L+2,1)=A(L+2,1)-EOL*(DKPT(M)*(1.-AR)-ELK(M)/RT)
          A(L+2,2)=A(L+2,2)+EOL
      206 CONTINUE
      215 FORMAT(1X12HEB(I),I=1,IS)
          IF(KR(7)-1) 225,225,220
      220 WRITE(KOUT,55)
          DO 221 I=1,ISP2
      221 WRITE(KOUT,50)(A(I,J),J=1,ISPQ),B(I)
          WRITE(KOUT,50)(E(I),I=1,IS)
      225 RETURN                                                        KINE1710
          END                                                           KINE1720
     CB29A                                                              B29A 001
          SUBROUTINE FIRSTG                                             B29A 002
          COMMON/BLOCOM/  MOA( 71),  MOB( 71),NSPEC,FR( 71,15),W(3),LEF(10) B29A   3
         1,LEFS(10),PIEASE,LEFW(10)                                     B29A   4
          COMMON/ETACOM/ETA(15),DETA(15),DSQ(14),DCU(14),B1(14),B2(14)   B29A   5
         1,LAR(153),BA1(43,18),BA2(30,15)                               B29A   6
          COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NB29A   7
         1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) B29A   8
         2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) B29A   9
         3,KAUXO,JTIME,JSPEC,MD(3)                                      B29A  10
          COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) B29A  11
         1,RNOSE,VKAP,NOISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO, B29A  12
         2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                        B29A  13
          COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                B29A  14
        3 FORMAT(8E10.4)                                                B29A 011
    4     FORMAT (3E10.4,5XI5,E10.4)                                    ENTR-MOD
        5 FORMAT(40I2)
          NUL=0
          IF(IABS(KR(2)-2)-1) 110,111,112
      110 DUM1=(GE(ITEM)-G(1,1))/(G(1,NETA)-G(1,1))                     B29A 013
          DO 113 I=1,NETA                                               B29A 014
          G(3,I)=G(3,I)*DUM1                                            B29A 015
          G(2,I)=G(2,I)*DUM1                                            B29A 016
      113 G(1,I)=G(1,1)+DUM1*(G(1,I)-G(1,1))                            B29A 017
          GO TO 152                                                     B29A 018
      111 READ(KIN,4) ALPH,F(1,1),F(2,1),IST,F(3,NETA)                  ENTR-MOD
          IF(KR(2).EQ.3) KR(2)=MINO(-IST,-1)
          ALSQ=ALPH*ALPH
          F(3,1)=F(3,1)*ALSQ
          READ(KIN,3)(F(2,I),I=1,NETA)
          BA1(MAT1I,1) = F(3,NETA)*ALSQ                                 ENTR-MOD
```

```
6439          CALL MATS1(BA1(1,1))
6440          DO 131 I=1,NETA                                          ENTR-MOD
6441       131 F(2,I)=F(2,I)*ALPH
6442          LL=2
6443          L=1
6444          I=1
6445          DO 134 M=1,MAT1I
6446          I=I+1
6447          IF(I-NETA) 133,133,132
6448       132 I=LL
6449          L=L+LL
6450          LL=1
6451       133 F(L,I)=BA1(M,1)-BA1(M,2)*F(1,1)-BA1(M,3)*F(3,1)
6452          DO 134 J=4,MAT1J                                         ENTR-MOD
6453       134 F(L,I)=F(L,I)-BA1(M,J)*F(2,J-3)
6454          DO 130 M=1,MAT1I
6455       130 BA1(M,1)=0                                              ENTR-MOD
6456          BA1(1,1)=1.0                                             ENTR-MOD
6457          CALL MATS2(BA1)
6458          DO 138 K=NUL,NSPM1
6459          READ(KIN,3) SP(2,1,K),(SP(1,I,K),I=1,NETA)
6460          SP(2,1,K)=SP(2,1,K)*ALPH
6461          L=2
6462          I=1
6463          DO 138 M=2,MAT2I
6464          I=I+1
6465          IF(I-NETA) 136,136,135
6466       135 I=1
6467          L=L+1
6468       136 SP(L,I,K)=BA1(M,1)*SP(1,NETA,K)-BA2(M,1)*SP(2,1,K)
6469          DO 138 J=2,MAT2J
6470       138 SP(L,I,K)=SP(L,I,K)-BA2(M,J)*SP(1,J-1,K)
6471          DO 140 M=1,MAT2I
6472       140 BA1(M,1)=0.
6473          IF(NSPM1.GT.0) READ(KIN,5) LEF
6474          GO TO 152                                                ENTR-MOD
6475       112 READ (KIN,3)GW                                          B29A 038
6476       195 ALPH= 4./ETA(KAPPA)                                     B29A 039
6477          F(1,1)=0.
6478          F(2,1)=0.                                                ENTR-MOD
6479          F(3,1)= ALPH/ETA(KAPPA)*(CBAR+CBAR+1.)                   ENTR-MOD
6480          DUM1=ALPH/ETA(KAPPA)*(CBAR-0.5)
6481          ETAT=ALPH/(F(3,1)-DUM1)
6482          DUM2=0.5/ETAT*ALPH/ETAT
6483          DUM3=ALPH/(ETA(KAPPA)-ETA(NETA))**2*(1.-CBAR)
6484          F(4,1)=-2.*DUM2
6485          DO 114 I=3,KAPPA
6486          IF(ETA(I-1)-ETAT) 108,109,109
6487       108 F(2,I-1)=(F(3,1)-DUM2*ETA(I-1))*ETA(I-1)
6488          F(3,I-1)=F(3,1)-2.*DUM2*ETA(I-1)
6489          F(4,I-1)=-2.*DUM2
6490          GO TO 114
6491       109 F(2,I-1)=ALPH/2.+DUM1*ETA(I-1)
6492          F(3,I-1)=DUM1
6493          F(4,I-1)=0.
6494       114 F(1,I-1)=F(1,I-2)+(F(2,I-2)+F(2,I-1))/2.*DETA(I-2)
6495          DO 107 I=KAPPA,NETA
6496          F(2,I)=ALPH-DUM3*(ETA(NETA)-ETA(I))**2
```

```
6497          F(3,I)=2.*DUM3*(ETA(NETA)-ETA(I))
6498          F(4,I)=-2.*DUM3
6499       107 F(1,I)=F(1,I-1)+(F(2,I)+F(2,I-1))/2.*DETA(I-1)
6500          DUM=(GE(ITEM)-GW)/ALPH
6501          DO 115 I=1,NETA
6502          G(1,I)=F(2,I)*DUM+GW
6503          G(2,I)=F(3,I)*DUM
6504       115 G(3,I)=F(4,I)*DUM
6505       152 CONTINUE                                                    B29A 059
6506      9901 FORMAT(1X1P12E10.3)                                         B29A 060
6507      9904 FORMAT(2X19HDEBUG FIRST GUESSES)                            B29A 061
6508           IF(KR(15)) 9902,9903,9902                                   B29A 062
6509      9902 CONTINUE                                                    B29A 063
6510           WRITE(KOUT,9904)                                            B29A 064
6511           DO 9906 I=1,4
6512      9906 WRITE(KOUT,9901) (F(I,J),J=1,NETA)
6513           DO 9905 K=NUL,NSPM1
6514           DO 9905 I=1,3
6515      9905 WRITE(KOUT,9901) (SP(I,J,K),J=1,NETA)
6516      9903 CONTINUE                                                    B29A 067
6517           RETURN                                                      B29A 068
6518           END                                                         B29+ 0
6519           FUNCTION ERP(X)
6520           TXS=2.*X*X
6521           IF(X-2.) 5,5,15
6522         5 R=0.8
6523           FN=31
6524           DO 10 I=1,15
6525           R=1.-R*TXS/FN
6526        10 FN=FN-2.
6527           ERP=R*X
6528           RETURN
6529      C    SEMI CONVERGENT SERIES FOR LARGE X --  INCLUDE 0 TO RAT OF
6530      C        SMALLEST TERM AND RAT TO 1. OF PRIOR TERM IF SMALLEST TERM IS
6531      C        SEVENTH OR PRIOR TERM.
6532        15 IN=(TXS-1.)/2.
6533           RAT=0.68
6534           IF(IN-6) 20,20,25
6535        20 FN=IN+IN-1
6536           R= (TXS-FN-2.)/2.*RAT
6537           R=R/TXS*(FN+2.)+R/RAT-R+RAT
6538           GO TO 30
6539        25 IN=7
6540           R=1.0
6541           FN=13
6542        30 DO 35 I=1,IN
6543           R=1.+R*FN/TXS
6544        35 FN=FN-2.
6545           ERP=R/(2.*X)
6546           RETURN
6547           END
6548      C8308
6549           SUBROUTINE ETIME
6550           COMMON/START/TZ
6551           CALL SECOND(TZ)
6552           RETURN
6553           END
6554           SUBROUTINE ETIMEF(T)
```

```
6555            COMMON/START/TZ
6556            CALL SECOND(T)
6557            T=T-TZ
6558            RETURN
6559            END
6560      C     B30C
6561            SUBROUTINE LIAD(L,I,J,C)
6562            COMMON/ERRCON/FLE( 43),GLE(30),SPLE(30, 8),ELA(313),FLEM,GLEM      B30C   3
6563           1,SPLEM( 8),ELM(14),ELMM,IFLM,IGLM,ISPLM( 8),NELM,ILMM,DFL(43)     B30C   4
6564           2,DGL(30),DSPL(30, 8),FNLE(18),GNLE(15),SPNLE(15, 8),ENL(153)      B30C   5
6565           3,FNLEM,GNLEM,SPNLEM( 8),          ENLMM,IFNLP,IGNLM,ISPNLM( 8)    B30C   6
6566           4,NENLM,INLMM,DFNL(18),DGNL(15),DSPNL(15, 8),DRNL(10)              B30C   7
6567            COMMON/ETACOM/ETA(15),DETA(15),DSG(14),DGU(14),B1(14),B2(14)      B30C   8
6568           1,LAR(153),BA1(43,18),BA2(30,15)                                   B30C   9
6569            COMMON/NONCOM/AM(153,153),DVNL(153),TCK,                          B30C  10
6570           1VLNKW,DLPH( 9),DLPK( 8, 9),DTHW,DTKW( 8),FLUXJB( 9)               B30C  11
6571            COMMON/INTCOM/KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA
6572            IF(L) 1,3,3
6573          1 ENL(I) = ENL(I) -C*FLE(J)
6574            DO 2 K=1,MAT1J                                                    ENTR-MOD
6575          2 AM(I,K)=AM(I,K)-C*BA1(J,K)
6576            RETURN
6577          3 ENL(I)=ENL(I)-C*SPLE(J,L)
6578            KK=L*MAT2J+MAT1J
6579            DO 4 K=1,MAT2J
6580            KK=KK+1
6581          4 AM(I,KK)=AM(I,KK)-C*BA2(J,K)
6582            RETURN
6583            END                                                               B05A5360
6584      CB30D
6585            SUBROUTINE TLEFT(I)
6586            I=100000
6587            RETURN
6588            END
6589      CB30E
6590            SUBROUTINE DATE(I,J)
6591            RETURN
6592            END
6593      CB30F
6594            SUBROUTINE TOD(I,J)
6595            RETURN
6596            END
6597            SUBROUTINE OGLE(N,XAM,PRM,DPDIM,NUMX,X,P,EM)                      ENTR-MOD
6598            DIMENSION XAM(1),X(1),P(1),EM(1),PRM(1),DPDIM(1)                  ENTR-MOD
6599            XDIF=X(NUMX)-X(1)                                                 ENTR-MOD
6600            IS=1                                                              ENTR-MOD
6601          2 DO 600 J=1,N                                                      ENTR-MOD
6602            XA=XAM(J)                                                         ENTR-MOD
6603         59 IO=1                                                              ENTR-MOD
6604            IT=1                                                              ENTR-MOD
6605         61 IF(XDIF) 72,60,71                                                 ENTR-MOD
6606         71 IF(XA-X(IS)) 62,63,64                                             ENTR-MOD
6607         72 IF(X(IS)-XA) 62,63,64                                             ENTR-MOD
6608         62 IF(IS-1) 671,671,68                                               ENTR-MOD
6609         68 IS=IS-1                                                           ENTR-MOD
6610            IT=2                                                              ENTR-MOD
6611            GO TO (61,66),IO                                                  ENTR-MOD
6612        672 IS=NUMX                                                           ENTR-MOD
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6613        671 I=IS                                                        ENTR-MOD
6614            M=0.                                                        ENTR-MOD
6615            OPDI=EM(I)                                                  ENTR-MOD
6616            GO TO 67                                                    ENTR-MOD
6617         63 PR=P(IS)                                                    ENTR-MOD
6618            OPDI=EM(IS)                                                 ENTR-MOD
6619            GO TO 601                                                   ENTR-MOD
6620         64 IS=IS+1                                                     ENTR-MOD
6621            IF(IS-NUMX) 69,69,672                                       ENTR-MOD
6622         69 IO=2                                                        ENTR-MOD
6623            GO TO (61,65),IT                                            ENTR-MOD
6624         65 IS=IS-1                                                     ENTR-MOD
6625         66 I=IS                                                        ENTR-MOD
6626            DX=X(I+1)-X(I)                                              ENTR-MOD
6627            XD=XA-X(I)                                                  ENTR-MOD
6628            G=(((P(I+1)-P(I))/DX)-EM(I))/DX                             ENTR-MOD
6629            F=(((EM(I+1)-EM(I))/DX)-2.*G)/DX                            ENTR-MOD
6630            H=(F*(XA-X(I+1))+G)*XD                                      ENTR-MOD
6631            OPDI=H+H+EM(I)+F*XD*XD                                      ENTR-MOD
6632         67 PR=(H+EM(I))*XD+P(I)                                        ENTR-MOD
6633        601 CONTINUE                                                    ENTR-MOD
6634            PRM(J)=PR                                                   ENTR-MOD
6635        600 OPDIM(J)=OPDI                                               ENTR-MOD
6636         60 CONTINUE                                                    ENTR-MOD
6637          4 RETURN                                                      ENTR-MOD
6638            END                                                         ENTR-MOD
6639      CB31A                                                             B31A 001
6640            SUBROUTINE CMA                                              B31A 002
6641      C       TWO MOVING BOUNDARY INTERNAL CONDUCTION PACKAGE           B31A 003
6642      C       AEROTHERM CORPORATION    RM KENDALL  C MOYER              B31A 004
6643            COMMON/CAMCOM/TLMC(20,10,2),TMG(20),TTS(20,10,2),TCHEM(20,10,2),  B31A 005
6644           1NLO(20),NMI(20),KMI(20),JCMA,IMG,IMC,NMG,                   B31A 006
6645           2TCH(2),TPR(2),TRAD(2),IAB                                   B31A 007
6646           3,TT2(20,2),THZ(20,2),TT1(30),TMG(30),DM12(2),TA(39),DELMG,I1,I2,CH  B31A 008
6647           4,CMD,BPRMG,KCM(10)                                          B31A 009
6648            EQUIVALENCE (NCLASS,JCMA)                                   B31A 010
6649            COMMON/LOOCOM/KOUT,IEX,DEN,VR,IMI(23),ILO(23),IR(23)        B31A 011
6650            COMMON/CMACOM/TEP(20,2), TCP(20, 2),TKP(20, 2)              B31A 012
6651           3,RHO(2),MATL(38),DEL(39),SO(20),M(38),RC(38),RA(38),RECORD(36),  B31A 013
6652           4AREA(38),EMA(38),RAV(38),                                   B31A 014
6653           5ROA(152),ROB(152),ROC(152),                                 B31A 015
6654           6    TPI(30),VFZ,CMM,NPR,                                    B31A 016
6655           7LCT,NPG,II,NBM,NUMN,NL,      DELM,RFT,RHORA,RHORB,RHORC,TRA  B31A 017
6656           8CA,TRACB,TRACC,RHOOA,RHOOB,RHOOC,EA,EB,EC,BA,BB,BC,PSIA,PSIB,PSIC,B31A 018
6657           9TRACM,PET,PETE,RSV,ETA,DTPR3,DTPR2,DTPRT,TPR3,TPR2,THZRO,THFIN,MT  B31A 019
6658            COMMON/CMACOM/EPSM,TRES,                                    B31A 020
6659           1TMMT,GAMA,OMG,NO,FJFM,FJFS,JF,JFMP,JFM,INPUT,     DTMIN,BRP,MCONV,B31A 021
6660           2INCM,DTMB,NN,NI,NOI,CMCRI,PYCRI,NCON,     NM,TX(30),F1(30),F2(30)  B31A 022
6661            COMMON/SBCP/BF,CMMA,CMMI,DERR,DMIV,EMIV,ERFX,ERRC,ERM,ERRS,I3,I4,  B31A 023
6662           1VRM,VRP, IPR,IRA,IRB,IRC,IRD,ITL,PMI,QQ,TABC,TEMP,TSMA,TSMI,TSSQ  B31A 024
6663            COMMON/SBCP/ TMXT,   DMCP(3),CPE(3),TO(20),VITER(51),EITER(51)  B31A 025
6664            COMMON/SBCP/ Y2(16),D2(16),Y3(8),D3(8),Y1(2),D1(2)          B31A 026
6665            COMMON/SBCP/ CPC( 50),CPV( 50),CP( 50),MP ( 50),MC( 50),CN( 50),  B31A 027
6666           1KAT( 50),ROT( 50),RO( 50),X( 50),RON( 50),CMDG( 50),RR ( 50),  B31A 028
6667           2CNC( 50),A( 50),B( 50),C( 50),D( 50),EMO( 50),CMO( 50)      B31A 029
6668            COMMON/SBCP/BR,   CMZ,    CMOL,    DEDT,DEDTT,DSDTB,CTH,GSMS,HM,  B31A 030
6669           1HE,    ITS,PRES,QCHEM,QCHEMT,QCOND,QCONDT,QCONV,QCONVT,QRA,QRP,  B31A 031
6670           2QRPT,RAD,RADT,RSU,SIG,   TSAVE,VF,XP1,ASU                   B31A 032
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      COMMON/MISC/      BPRH,CMT,CCLD,CP1,CPGAS,CPNL,CZ,DCDT,DECOM,      B31A 033
     1DECOMT,DELCR,DELR,DENOLD,DIDT,DNS,DPDT,DRLCP,DRLC,DRLP,DRL,DRCAC,  B31A 034
     2DROAT,DROBC,DROCT,DROCC,DROCT,DROOTD,DSDT,DSI,DS,DSS,DTA,DTMC,DTMS B31A 035
     3,DTS,DVB,DZ,EGO,EZ,FACT1,FACT2,FA,FB,FC,FJF,FK,FZ,GSEGR,GSM,GSMT,  B31A 036
     4GZ,H1,HAPHB,HBAR,HGAS,HRES,IE,IMIN,I,IS,ISV,ITER,J1,J,KK,K,KT,L,   B31A 037
     5NDR,NLI,NLM,N,NZ,O,PGPU,PGPUT,POLD,POW,QLOSS,QLOSST,RD,RO1,ROOZ,SA B31A 038
     6,SOEGR,TAS,TB,TERM1,TERM2,TERM3,THOS,TH,THPRT,TN,TOP1,TOP2,TOP3,T, B31A 039
     7TT,VOL,X1                                                          B31A 040
      EQUIVALENCE (DH1,DH12(1)),(DH2,DH12(2)),(TS,TA)                    B31A 041
  542 FORMAT(/33X14H----OUTPUT----)                                      B31A 042
  543 FORMAT(//6X14(2H- )F11.4,9H SECONDS 14(2H -))
  544 FORMAT(6X,4HTIME,2X,4HSURF,2X,4HPROB,2X,7HSURFACE,5X,6HH WALL,    B31A 045
     14X,6HH EDGE,6X,10HHEAT COEFF,6X,6HCN/CHO/6X,4HSTEP,2X,4HITER,2X,4HB31A 046
     20PTN,2X,8HRAD (IN),3X,8H(BTU/LB),2X,8H(BTU/LB),3X,14H(LB/SQ FT-SECB31A 047
     3))                                                                B31A 048
  545 FORMAT(6X,I4,2I6,F10.4,F11.2,F10.2,F12.4,7X,F8.5/1H )              B31A 049
  546 FORMAT(33X,20H---ABLATION RATES---)                                B31A 050
  547 FORMAT(8X,7HB PRIME,3X,9HB PRIME G,3X,10HH DOT CHAR,3X,9HH DOT GASB31A 051
     16X,6HH CHAR,7X,5HH GAS/34X,14H(LB/SQ FT-SEC),11X,15H(LB/ORIG SQ FTB31A 052
     2))                                                                B31A 053
  548 FORMAT(8X,F8.5,2X,F8.5,4(3X,F10.6)/1H )                            B31A 054
 5480 FORMAT(27X,32H---RECESSIONS/RECESSION RATES---/                    B31A 055
     133X,19H(IN)    /    (IN/SEC)/                                     B31A 056
     2  16X,7HSURFACE,16X,6HCHAR (,F4.2,1H),11X,11HPYROLYSIS (,F4.2,1H))B31A 057
 5481 FORMAT(5X,3(4X,F10.7,1H/,F9.7)/1H )                               B31A 058
 5482 FORMAT(27X,31H---SURFACE ENERGY FLUX TERMS---/25X,37HCURRENT RATESB31A 059
     1 (BTU/SQ FT SURFACE-SEC)/24X,38HAND INTEGRATED VALUES (BTU/ORIG SQB31A 060
     2 FT)/                                                             B31A 061
     3    13X,10HCONVECTED ,4X,10H RADIATED ,4X,10H RADIATED ,4X,10H CHEB31A 062
     4MICAL ,4X,10HCONDUCTION/17X,2HIN,12X,2HIN,11X,3HOUT,8X,10HGENERATIB31A 063
     5ON,7X,4HAWAY)                                                     B31A 064
 5483 FORMAT (6X,4HRATE,3X,5(E10.3,4X)/6X,5HTOTAL,2X,5(E10.3,4X)/1H )   B31A 065
 5484 FORMAT(30X,27H---INTERIOR ENERGY TERMS---/25X,37HCURRENT RATES (BTB31A 066
     1U/SQ FT SURFACE-SEC)/24X,38HAND INTEGRATED VALUES (BTU/ORIG SQ FT)B31A 067
     2/                                                                 B31A 068
     3       13X,9HPYROL GAS,7X,6HDECOMP,6X,10HCONVECTION,6X,7HSTORAGE, B31A 069
     47X,7HLOSS AT/14X,7HPICK UP,6X,10HABSORPTION,3X,11HWITH SOLIDS,5X, B31A 070
     58HIN SOLID,6X,9HREAR FACE)                                        B31A 071
 5485 FORMAT (6X,4HRATE,3X,5(E10.3,4X)/6X,5HTOTAL,2X,5(E10.3,4X)/1H )   B31A 072
  549 FORMAT (6X4HNODE MAT3X4HTEMP3X7HDENSITY3X8HENTHALPY2X8HNODE MAT3X4B31A 073
     1HTEMP3X7HDENSITY3X8HENTHALPY/15X7H(DEG R)11H (LB/CU FT)9H (BTU/LB)B31A 074
     211X7H(DEG R)11H (LB/CU FT)9H (BTU/LB))                            B31A 075
 5490 FORMAT(6X,8HNODE MAT,3X,4HTEMP,3X,7HDENSITY,2X,9HCOND(BTU/,2X,8HNOB31A 076
     1DE MAT,3X,4HTEMP,3X,7HDENSITY,2X,9HCOND(BTU//)5X,7H(DEG R),11H (LBB31A 077
     2/CU FT/,9H FT SC F),11X,7H(DEG R),11H (LB/CU FT),9H FT SC F))     B31A 078
  550 FORMAT (5X2I4,F9.2,F10.3,2XF8.2,1X2I4,F9.2,F10.3,F10.2)           B31A 079
 5500 FORMAT(5X,2I4,F9.2,F10.3,2X,F8.6,1X,2I4,F9.2,F10.3,F10.6)         B31A 080
  551 FORMAT(1H1110X65HAEROTHERM CHARRING MATERIAL THERMAL RESPONSE AND AB31A 081
     1LATION PROGRAM//73X4HPAGE13/1H 67X2A6)                            B31A 082
  552 FORMAT(9X,67HOPTIONAL OUTPUT OF THERMOCOUPLE TEMPERATURES AND/OR IB31A 083
     1SOTHERM DEPTHS/24X,37HDEPTHS MEASURED FROM ORIGINAL SURFACE/24X,   B31A 084
     231HTEMPERATURES IN DEGREES RANKINE//6X,77HEACH OUTPUT BLOCK SHOWS B31A 085
     3THE TIME IN SECONDS, THE CURRENT SURFACE TEMPERATURE,/6X,20HTHE TEB31A 086
     4MPERATURES OF ,I2,44H THERMOCOUPLES, AND THE DEPTHS IN INCHES OF ,B31A 087
     512,10H ISOTHERMS//6X,74HTHE FIRST BLOCK SHOWS A SAMPLE TIME AND SURB31A 088
     6FACE TEMPERATURE, THE SPECIFIED/6X,73HDEPTHS OF THE THERMOCOUPLESB31A 089
     7 (IF ANY) AND THE ISOTHERM TEMPERATURES.  THE/6X,75HARRANGEMENT OFB31A 090
     8F THIS BLOCK CORRESPONDS TO THE ARRANGEMENT OF THE OUTPUT DATA.//  B31A 091
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6729          9(10(2X,F10.4))                                                  831A 092
6730        553 FORMAT (//6X,11HOUTPUT DATA//)                                 831A 093
6731        554 FORMAT (10(2X,F10.4))                                          831A 094
6732        581 FORMAT(8F10.4/(10X7F10.4))                                     831A 095
6733        582 FORMAT(12E10.3)                                                831A 096
6734      C                                                                    831A 097
6735      C                                                                    831A 098
6736       7600 GO TO (7601,6061,761,761,761),JCMA                             831A 099
6737       7601 CONTINUE                                                       831A 100
6738            DNCP(3)=99999.                                                 831A 101
6739            SIG=.481E-12                                                   831A 102
6740      C     CHAR AND PYROLYSIS ZONE CRITERIAL DENSITIES                    831A 103
6741            DNCP(1)=RHO(2)+CHCRI*(RHO(1)-RHO(2))                           831A 104
6742            DNCP(2)=RHO(2)+PYCRI*(RHO(1)-RHO(2))                           831A 105
6743      C                                                                    831A 106
6744      C     INITIAL VALUES FOR TIME LOOP                                   831A 107
6745      C                                                                    831A 108
6746       1398 ITER=-1                                                        831A 109
6747            DTHC=DTHB                                                      831A 110
6748            CHH=1.0                                                        831A 111
6749            THZRO=TPR(2)                                                   831A 112
6750            THXT=TPR(2)                                                    831A 113
6751            TPR2=TPR2+THZRO                                                831A 114
6752            TPR3=TPR3+THZRO                                                831A 115
6753            THFIN=TPR(1)                                                   831A 116
6754            IAB=0                                                          831A 117
6755            ITS=0                                                          831A 118
6756            SA=0.0                                                         831A 119
6757            GSMT=0.0                                                       831A 120
6758            GSMS=0.                                                        831A 121
6759            CHD=0.0                                                        831A 122
6760            CMT=0.                                                         831A 123
6761            DSDTB=0.0                                                      831A 124
6762            DSDT=0.                                                        831A 125
6763            DSI=0.                                                         831A 126
6764            DIDT=0.                                                        831A 127
6765            CPE(1)=0.                                                      831A 128
6766            CPE(2)=0.                                                      831A 129
6767            COLD=0.                                                        831A 130
6768            POLD=0.                                                        831A 131
6769            DCDT=0.                                                        831A 132
6770            DPDT=0.                                                        831A 133
6771            QCOND=0.                                                       831A 134
6772            QCONV=0.                                                       831A 135
6773            QCHEM=0.                                                       831A 136
6774            RAD=0.                                                         831A 137
6775            QRP=0.                                                         831A 138
6776            QCONVT=0.                                                      831A 139
6777            QRPT=0.                                                        831A 140
6778            RADT=0.                                                        831A 141
6779            QCHEMT=0.                                                      831A 142
6780            QCONDT=0.                                                      831A 143
6781            PGPUT=0.                                                       831A 144
6782            DECOMT=0.                                                      831A 145
6783            DEDTT=0.                                                       831A 146
6784            QLOSST=0.                                                      831A 147
6785            TT=0.                                                          831A 148
6786            T0=0.                                                          831A 149
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6787            SOEGR=0.                                                        B31A 150
6788            GSEGR=0.                                                        B31A 151
6789            PGPU=0.                                                         B31A 152
6790            DECOM=0.                                                        B31A 153
6791            EGO=0.                                                          B31A 154
6792            HW=0.                                                           B31A 155
6793            BR=0.                                                           B31A 156
6794            KK=0                                                            B31A 157
6795            TH=THZRO                                                        B31A 158
6796            THDS=THZRO-DTHIN                                                B31A 159
6797            THPRT=TH                                                        B31A 160
6798            REWIND 3                                                        B31A 161
6799            CALL LCOUNT (-2,LCT,NPG,RECORD(35))                             B31A 162
6800            WRITE (KOUT,542)                                                B31A 163
6801            IS=0                                                            B31A 164
6802            DTH=DTHIN                                                       B31A 165
6803            RSU=ABS(RSV)                                                    B31A 166
6804            DELCR=AMIN1(DEL(1),DELM)/5.0                                    B31A 167
6805            TSAVE=TA(1)+1.0                                                 B31A 168
6806            FA=(1.-PSIA)*BA*(RHOOA**(1.-PSIA))                              B31A 169
6807            FB=(1.-PSIB)*BB*(RHOOB**(1.-PSIB))                              B31A 170
6808            FC=(1.-PSIC)*BC*(RHOOC**(1.-PSIC))                              B31A 171
6809      C                                                                     B31A 172
6810      C     BEGINNING OF TIME LOOP                                          B31A 173
6811      C                                                                     B31A 174
6812        410 ITER=ITER+1                                                     B31A 175
6813            JCMA=1                                                          B31A 176
6814      C                                                                     B31A 177
6815      C     CALCULATION OF NODAL PROPERTIES                                 B31A 178
6816      C                                                                     B31A 179
6817            DO 108 N=2,NL                                                   B31A 180
6818        108 RA(N-1)=RA(N-1)+DSI                                             B31A 181
6819            RA(NL)=RA(NL)+DSI/2.                                            B31A 182
6820            CALL OGLE(NL,RA,RR,NUMN,RAV,AREA,EMA)                           B31A 183
6821            ASU=RR(1)                                                       B31A 184
6822            J=1-JF+H-JF                                                     B31A 185
6823        100 DO 105 N=1,NL                                                   B31A 186
6824            J=J+JF                                                          B31A 187
6825            RR(N)=RR(N)/ASU                                                 B31A 188
6826            CALL LOOK (3,TA(N),TT2,TCP,TKP,THZ,0,Y2,Y2(4),3)                B31A 189
6827            CN(N)=Y2(2)                                                     B31A 190
6828            CPV(N)=Y2(1)                                                    B31A 191
6829            HP(N)=Y2(3)+DH1                                                 B31A 192
6830            CALL LOOK (4,TA(N),TT2(1,2),TCP(1,2),TKP(1,2),THZ(1,2),0,Y2,02,3) B31A 193
6831            CNC(N)=Y2(2)                                                    B31A 194
6832            CPC(N)=Y2(1)                                                    B31A 195
6833            HC(N)=Y2(3)+DH2                                                 B31A 196
6834            IF (IATL(N)-1) 103,101,102                                      B31A 197
6835        101 X(N)=1.                                                         B31A 198
6836            CP(N)=CPV(N)                                                    B31A 199
6837            H(N)=HP(N)                                                      B31A 200
6838            RO(N)=RHO(1)                                                    B31A 201
6839            ROT(N)=RHO(1)                                                   B31A 202
6840            GO TO 105                                                       B31A 203
6841        102 X(N)=0.                                                         B31A 204
6842            CN(N)=Y2(2)                                                     B31A 205
6843            H(N)=HC(N)                                                      B31A 206
6844            CP(N)=CPC(N)                                                    B31A 207
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6845            RO(N)=RHO(2)                                                    B31A 208
6846            ROT(N)=RHO(2)                                                   B31A 209
6847            GO TO 105                                                       B31A 210
6848          103 X(N) = PETE-PET/RO(N)                                         B31A 211
6849            H(N)=X(N)*HP(N)+(1.-X(N))*HC(N)                                 B31A 212
6850            CP(N)=X(N)*CPV(N)+(1.-X(N))*CPC(N)                              B31A 213
6851            IF(N-1) 109,109,104                                             B31A 214
6852          109 ROT(1)=GAMA*(ROA(1)+ROB(1))+OMG*ROC(1)                        B31A 215
6853            GO TO 105                                                       B31A 216
6854          104 ROT(N)=(ROA(J)+ROB(J))*GAMA+OMG*(ROC(J))                      B31A 217
6855          105 CONTINUE                                                      B31A 218
6856            IF (NUMN-NBM) 112,106,106                                       B31A 219
6857          106 DO 107 N=NBM,NUMN                                             B31A 220
6858            RR(N)=AREA(N)/ASU                                               B31A 221
6859            KT=MATL(N)                                                      B31A 222
6860            CALL LOOK(KT+2,TA(N),TT2(1,KT),TCP(1,KT),TKP(1,KT),0,0,Y2,D2,2) B31A 223
6861            CP(N)=Y2(1)                                                     B31A 224
6862            CN(N)=Y2(2)                                                     B31A 225
6863            RAT(N)=DEL(N)/(CN(N)*RR(N))                                     B31A 226
6864          107 RO(N)=RHO(KT)                                                 B31A 227
6865          112 HRES=SIG*EPSW*(TA(NUMN)+TRES)*(TA(NUMN)**2+TRES**2)+HCONV+1.E-30
6866            RAT(NUMN+1)=1./(HRES*RR(NUMN)+.00000001)                        B31A 229
6867            QLOSS=(TA(NL)-TA(NBM))/(0.5*(RAT(NL)+RAT(NBM))+RC(NL)/RR(NL))   B31A 230
6868            QLOSST=QLOSST+QLOSS*DTH/AREA(1)*ASU                             B31A 231
6869            CMT=CMT+RHO(2)*DSDT*ASU/AREA(1)*DTH                             B31A 232
6870            DEL(NUMN+1)=CN(NUMN)/HRES                                       B31A 233
6871            RR(NUMN+1)=RR(NUMN)                                             B31A 234
6872            DTHS=DTH                                                        B31A 235
6873            DTS=TSAVE-TA(1)                                                 B31A 236
6874            IF(ITER) 151,113,151                                            B31A 237
6875          113 DEDT=0.                                                       B31A 238
6876            ITER=1                                                          B31A 239
6877            CH=TCH(2)                                                       B31A 240
6878            JCMA=2                                                          B31A 241
6879            GO TO 3000                                                      B31A 242
6880      C                                                                     B31A 243
6881      C     OUTPUT                                                          B31A 244
6882      C                                                                     B31A 245
6883          151 JCMA=2                                                        B31A 246
6884            IF(TH-TNXT+.00001) 700,3000,3000                                B31A 247
6885          700 JCMA=1                                                        B31A 248
6886            IF(TH-THPRT+.00001) 3410,3000,3000                              B31A 249
6887         3410 IDUMP=1                                                       B31A 250
6888            IF(KCM(4)) 4410,4410,3411                                       B31A 251
6889         3000 IDUMP=0                                                       B31A 252
6890         3411 DIDT=12.*DSDTB                                                B31A 253
6891            NDR=NBM-NL-1                                                    B31A 254
6892            NLI=(NUMN-NDR+1)/2                                              B31A 255
6893            CALL LCOUNT(33+NLI,LCT,NPG,RECORD(35))                          B31A 256
6894          322 WRITE (KOUT,543)TH                                            B31A 257
6895            WRITE (KOUT,544)                                                B31A 258
6896            WRITE (KOUT,545) ITER,ITS,II    ,RSU,HW,HE,CH,BR                B31A 259
6897            WRITE (KOUT,546)                                                B31A 260
6898            WRITE (KOUT,547)                                                B31A 261
6899            BPRM=(GSMS+CMD)/CH                                              B31A 262
6900            BPRMG=GSMS/CH                                                   B31A 263
6901            WRITE (KOUT,548) BPRM,BPRMG,CMD,GSMS,CMT,GSMT                   B31A 264
6902            WRITE (KOUT,5480) CHCRI,PYCRI                                   B31A 265
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6903          WRITE (KOUT,5481) SA,DIDT,CPE(1),DCDT,CPE(2),DPDT                    B31A 266
6904          WRITE (KOUT,5482)                                                    B31A 267
6905       3224 WRITE (KOUT,5483) QCONV,QRP,RAD,QCHEM,QCOND,QCONVT,QRPT,RADT,QCHEMB31A 268
6906          1T,QCONDT                                                           B31A 269
6907          WRITE (KOUT,5484)                                                   B31A 270
6908          WRITE (KOUT,5485)PGPU,DECOM, TB,DEDT,QLOSS,PGPUT,DECOMT, TT,DEDTT,B31A 271
6909          1QLOSST                                                             B31A 272
6910          IF (NCON) 3020,3020,3021                                            B31A 273
6911       3021 WRITE(KOUT,5490)                                                  B31A 274
6912          GO TO 3022                                                          B31A 275
6913       3020 WRITE(KOUT,549)                                                   B31A 276
6914       3022 CONTINUE                                                          B31A 277
6915          IF(IDUMP) 3023,3023,190                                             B31A 278
6916       3023 IF(NOI) 190,190,183                                               B31A 279
6917        183 CALL SLOPQ (NL,RA(1),TA(1),EMO(1),EMO(1))                         B31A 280
6918          IF(NO) 182,182,184                                                  B31A 281
6919        184 CALL OGLE (NO,SO,TO(1),NL,RA(1),TA(1),EMO(1))                     B31A 282
6920        182 IF (NI) 189,189,185                                               B31A 283
6921        185 DO 186 I=1,NL                                                     B31A 284
6922        186 EMO(I)=1./EMO(I)                                                  B31A 285
6923          CALL OGLE (NI,SO(NO+1),TO(NC+1),NL,TA,RA,EMO)                       B31A 286
6924        189 IF (NN) 188,188,187                                               B31A 287
6925        187 WRITE (7,581) TH,TS,(TO(I), I=1,NOI)                              B31A 288
6926        188 WRITE (3) TH,TS, (TO(I), I=1,NOI)                                 B31A 289
6927          KK=KK+1                                                             B31A 290
6928        190 CONTINUE                                                          B31A 291
6929          IF (NCON) 3012,3012,3006                                            B31A 292
6930       3006 DO 3009 I=1,NL                                                    B31A 293
6931          IF (WT) 3007,3007,3008                                              B31A 294
6932       3008 CALL LOOK(11,X(I),TX,F1,F2,C,0,Y1,D1,2)                          B31A 295
6933          CNO(I)=Y1(1)*CN(I)+Y1(2)*CNC(I)                                     B31A 296
6934          GO TO 3009                                                          B31A 297
6935       3007 CNO(I)=X(I)*CN(I)+(1.0-X(I))*CNC(I)                               B31A 298
6936       3009 CONTINUE                                                          B31A 299
6937       3012 CONTINUE                                                          B31A 300
6938          D  3011 J=1,NLI                                                     B31A 301
6939          K=NLI                                                               B31A 302
6940          L=J                                                                 B31A 303
6941          IF (L-NL) 3002,3002,3001                                            B31A 304
6942       3001 L=L+NDR                                                           B31A 305
6943          GO TO 3003                                                          B31A 306
6944       3002 IF (L+NLI-NL) 3003,3003,3005                                      B31A 307
6945       3005 K=NLI+NDR                                                         B31A 308
6946       3003 N=MIND(NUMN,K+L)                                                  B31A 309
6947          IF (NCON) 3004,3004,3010                                            B31A 310
6948       3004 WRITE (KOUT,550) (I,MATL(I),TA(I),RO(I),H(I), I=L,N,K)           B31A 311
6949          GO TO 3011                                                          B31A 312
6950       3010 WRITE(KOUT,5500)(I,MATL(I),TA(I),RO(I),CNO(I),I=L,N,K)           B31A 313
6951       3011 CONTINUE                                                          B31A 314
6952          IF(IDUMP) 3225,3225,4410                                            B31A 315
6953       3225 IF(TH-THFIN+0.00001)1151,2    ,2                                 B31A 316
6954          2 JCMA=JCMA-1                                                       B31A 317
6955            IF (NOI) 1,1,3                                                    B31A 318
6956          3 REWIND 3                                                          B31A 319
6957            CALL LCOUNT (-1,LCT,NPG,RECORD(35))                               B31A 320
6958            WRITE (KOUT,552) NO,NI,TH,TS,(SO(I), I=1,NCI)                     B31A 321
6959            WRITE (KOUT,553)                                                  B31A 322
6960            DO 4 K=1,KK                                                       B31A 323
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6961            READ (3) TH,TS, (TO(I), I=1,NOI)                                    B31A 324
6962          4 WRITE (KOUT,554) TH,TS, (TO(I), I=1,NOI)                            B31A 325
6963            GO TO 1                                                             B31A 326
6964       1151 IF(JCMA-2) 606,799,606                                              B31A 327
6965       6061 TNXT=AMAX1(TPR(1),TPR(2))                                           B31A 328
6966        606 IF(TH-TPR2+0.00001)  154,158,158                                    B31A 329
6967        158 DTPRT=DTPR2                                                         B31A 330
6968            DTPR2=DTPR3                                                         B31A 331
6969            TPR2=TPR3                                                           B31A 332
6970            TPR3=THFIN                                                          B31A 333
6971        154 THPRT=AMIN1(THPRT+DTPRT,TPR2,TNXT)                                  B31A 334
6972       4410 DTH=AMIN1(DTH8,DELCR/(DSDTB+.0000001),TH-THDS, 50.0/(ABS(TSAVE-TA(B31A 335
6973           11))+.1)*DTH)                                                        B31A 336
6974            TSAVE=TA(1)                                                         B31A 337
6975            DTH=(THPRT-TH)/(AINT((THPRT-TH)/DTH+1.0))                           B31A 338
6976        144 TH=TH+DTH                                                           B31A 339
6977        610 IF(DTH-.000001) 162,162,608                                         B31A 340
6978        162 WRITE (KOUT,582) TH,DTH,DTHS,DTH8,THDS,DTS,DELCR,DSDTB              B31A 341
6979            TH=THFIN                                                            B31A 342
6980            JCMA=0                                                              B31A 343
6981            GO TO 3000                                                          B31A 344
6982       C                                                                        B31A 345
6983       C    INTERNAL DECOMPOSITION  --  DENSITY CALCULATION                     B31A 346
6984         608 N=-JFH                                                             B31A 347
6985       C                                                                        B31A 348
6986       C    SPECIFY SURFACE CHANGES DURING THIS TIME INTERVAL                   B31A 349
6987            DSDT=DSDTB                                                          B31A 350
6988            DS=DSDT*DTH                                                         B31A 351
6989            DSI=12.0*DS                                                         B31A 352
6990            SA=SA+DSI                                                           B31A 353
6991            RSU=ABS(RSV+SA)                                                     B31A 354
6992            DTH8=DTHC                                                           B31A 355
6993            DEL(NL)=DEL(NL)-DS                                                  B31A 356
6994            FK=0.0                                                              B31A 357
6995            FJF=FJFH                                                            B31A 358
6996            J1=JFHP                                                             B31A 359
6997            DENOLD=RHO(2)                                                       B31A 360
6998            COLD=CPE(1)                                                         B31A 361
6999            POLD=CPE(2)                                                         B31A 362
7000            CPE(1)=SA                                                           B31A 363
7001            CPE(2)=SA                                                           B31A 364
7002            IE=1                                                                B31A 365
7003            ROOZ=0.0                                                            B31A 366
7004            DTA=0.
7005            TA(NL+1)=TA(NBM)                                                    B31A 369
7006            DEL(NL+1)=DEL(NBM)                                                  B31A 370
7007            RR(NL+1)=RR(NBM)                                                    B31A 371
7008            DO 252 I=1,NL                                                       B31A 372
7009            ISV=MIN0(NL,I+1)
7010            OMDG(I)=0.0                                                         B31A 373
7011            RON(I)=ROOZ                                                         B31A 374
7012            OSS=FJF/DEL(I)*DSDT                                                 B31A 375
7013            J2=J1                                                               B31A 376
7014            DO 255 J=J2,JF                                                      B31A 377
7015            N=N+J1-1                                                            B31A 378
7016            IF (J-JFHP) 253,259,253                                             B31A 379
7017        259 IF(MATL(I)+MATL(ISV)-4) 263,260,263
7018        263 IF(AMAX1(TA(I),TA(I+1))-TRACM)261,261,262                           B31A 381
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7019      261 IF(MATL(I)+MATL(I)+MATL(ISV)-3) 262,260,262
7020      260 J1=JFHP                                                          B31A 383
7021          ROOZ=FJFH*RO(I+1)                                                B31A 384
7022          RON(I)=RON(I)+FJFH*RO(I)                                         B31A 385
7023          N=N+JFH                                                          B31A 386
7024          GO TO 264                                                        B31A 387
7025      262 ROOZ=0.0                                                         B31A 388
7026          J1=1                                                             B31A 389
7027          DTA=(TA(I+1)-TA(I))/(FJFS+FJF/DEL(I)*DEL(I+1)/RR(I)*RR(I+1))     B31A 390
7028          TAS=TA(I)                                                        B31A 391
7029      253 N=N+1                                                            B31A 392
7030          IF(ABS(DSS)-.000001) 1016,1016,1017                              B31A 393
7031     1016 DROAC=0.                                                         B31A 394
7032          DROBC=0.                                                         B31A 395
7033          DROCC=0.                                                         B31A 396
7034          GO TO 1021                                                       B31A 397
7035     1017 IF(I-NL) 1015,1018,1015                                          B31A 398
7036     1018 FK=FK-1.0                                                        B31A 399
7037          IF(FK) 1019,1016,1020                                            B31A 400
7038     1019 FK=FJF-1.0                                                       B31A 401
7039     1020 DSS=DSDT/DEL(I)*FK                                               B31A 402
7040     1015 IF (N-1) 1115,1215,1115                                          B31A 403
7041     1115 DROAC=(ROA(N+1)-ROA(N))*DSS                                      B31A 404
7042          DROBC=(ROB(N+1)-ROB(N))*DSS                                      B31A 405
7043          DROCC=(ROC(N+1)-ROC(N))*DSS                                      B31A 406
7044          GO TO 1021                                                       B31A 407
7045     1215 CONTINUE                                                         B31A 408
7046     1315 DROAC=(ROA(N+1)-RHORA)*DSS                                       B31A 409
7047          DROBC=(ROB(N+1)-RHORB)*DSS                                       B31A 410
7048          DROCC=(ROC(N+1)-RHORC)*DSS                                       B31A 411
7049          ROT(1)=RHO(2)                                                    B31A 412
7050     1021 TAS=TAS+DTA                                                      B31A 413
7051          IF(TAS-TRACM) 227,227,229                                        B31A 414
7052      229 IF(TAS  -TRACA) 201,201,202                                      B31A 415
7053      201 DROAT=0.0                                                        B31A 416
7054          GO TO 2113                                                       B31A 417
7055      202 IF(RHORA-ROA(N)) 211,201,201                                     B31A 418
7056      211 RD=ROA(N)-RHORA                                                  B31A 419
7057          POW=1.-PSIA                                                      B31A 420
7058          IF(POW)2111,2112,2111                                            B31A 421
7059     2111 DROAT=(-RD+((RD**POW)-                    FA*EXP(-EA/TAS)*DTH)**  B31A 422
7060         1(1./POW))/DTH                                                    B31A 423
7061          GO TO 2113                                                       B31A 424
7062     2112 DROAT=RD*(EXP(-EA*DTH*EXP(-EA/TAS))-1.)/DTH                      B31A 425
7063     2113 ROA(N)=ROA(N)+(DROAT+DROAC)*DTH                                  B31A 426
7064      221 IF(TAS  -TRACB) 203,203,204                                      B31A 427
7065      203 DROBT=0.0                                                        B31A 428
7066          GO TO 2133                                                       B31A 429
7067      204 IF(RHORB-ROB(N)) 213,203,203                                     B31A 430
7068      213 RD=ROB(N)-RHORB                                                  B31A 431
7069          POW=1.-PSIB                                                      B31A 432
7070          IF(POW)2131,2132,2131                                            B31A 433
7071     2131 DROBT=(-RD+((RD**POW)-                    FB*EXP(-EB/TAS)*DTH)**  B31A 43
7072         1(1./POW))/DTH                                                    B31A 435
7073          GO TO 2133                                                       B31A 436
7074     2132 DROBT=RD*(EXP(-BB*DTH*EXP(-EB/TAS))-1.)/DTH                      B31A 437
7075     2133 ROB(N)=ROB(N)+(DROBT+DROBC)*DTH                                  B31A 438
7076      223 IF(TAS  -TRACC) 205,205,206                                      B31A 439
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7077        205 DROCT=0.0                                                                  831A 440
7078            GO TO 2153                                                                 831A 441
7079        206 IF(RHORC-ROC(N))215,205,205                                                831A 442
7080        215 RD=ROC(N)-RHORC                                                            831A 443
7081            POW=1.-PSIC                                                                831A 444
7082            IF (POW) 2151,2152,2151                                                    831A 445
7083       2151 DROCT=(-RD+((RD**POW)-                    FC*EXP(-EC/TAS)*DTH)**          831A 446
7084           1(1./POW))/DTH                                                             831A 447
7085            GO TO 2153                                                                 831A 448
7086       2152 DROCT=RD*(EXP(-BC*DTH*EXP(-EC/TAS))-1.)/DTH                               831A 449
7087       2153 ROC(N)=ROC(N)+(DROCT+DROCC)*DTH                                           831A 450
7088        225 DMDG(I)=DMDG(I)-DEL(I)*((DROAT+DROBT)*GAMA+OMG*DROCT)                     831A 451
7089        227 DNS=(ROA(N)+ROB(N))*GAMA+OMG*ROC(N)                                       831A 452
7090            RON(I)=RON(I)+DNS                                                          831A 453
7091            IF(N-1) 2251,2253,2251                                                     831A 454
7092       2251 IF(DNS-DNCP(IE)) 2253,2252,2252                                           831A 455
7093       2252 CPE(IE)=DEL(I)*((FLOAT(N)-0.5)/FJF+1.-FLOAT(I))*12.+RA(I)                 831A 456
7094            CPE(IE)=CPE(IE)-DEL(I)/(DNS-DENOLD+1.E-36)*(DNS-DNCP(IE))/FJF*12.
7095            CPE(IE)=AMAX1(CPE(IE),SA)                                                  831A 458
7096            IE=IE+1                                                                    831A 459
7097       2253 DENOLD=DNS                                                                831A 460
7098        255 TAS=TAS+DTA                                                               831A 461
7099        264 DMDG(I)=DMDG(I)/FJF*RR(I)                                                 831A 462
7100            RON(I)=RON(I)/FJF                                                          831A 463
7101            IF(I-1) 257,257,254                                                        831A 464
7102        257 FJF=FJFS                                                                   831A 465
7103            DTA=DTA/DEL(1)*DEL(2)/2.*RR(2)                                             831A 466
7104            GO TO 252                                                                  831A 467
7105        254 DTA=DTA/DEL(I)*DEL(I+1)/RR(I)*RR(I+1)                                      831A 468
7106        252 CONTINUE                                                                   831A 469
7107      C     NOW SPECIFY NECESSARY NEW POST-DECOMPOSITION PROPERTIES                     831A 470
7108            J=JFHP                                                                     831A 471
7109            DO 85 I=1,NL                                                               831A 472
7110            IF(ABS(RON(I)-RHO(1))-.01) 81,81,82                                        831A 473
7111         81 MATL(I)=1                                                                  831A 474
7112            X(I)=1.0                                                                   831A 475
7113            GO TO 85                                                                   831A 476
7114         82 IF (ABS(RON(I)-RHO(2))-.01) 83,83,84                                       831A 477
7115         83 MATL(I)=2                                                                  831A 478
7116            X(I)=0.                                                                    831A 479
7117            CN(I)=CNC(I)                                                               831A 480
7118            GO TO 85                                                                   831A 481
7119         84 MATL(I)=0                                                                  831A 482
7120            X(I)=PETE-PET/RON(I)                                                       831A 483
7121            IF (WT) 8500,8500,8501                                                     831A 484
7122       8501 CALL LOOK(11,X(I),TX,F1,F2,0,0,Y1,D1,2)                                   831A 485
7123            CN(I)=Y1(1)*CN(I)+Y1(2)*CNC(I)                                             831A 486
7124            GO TO 85                                                                   831A 487
7125       8500 CN(I)=X(I)*CN(I)+(1.0-X(I))*CNC(I)                                        831A 488
7126         85 RAT(I)=DEL(I)/(CN(I)*RR(I))                                               831A 489
7127            GSM=0.0                                                                    831A 491
7128            DO 122 I=1,NL                                                              831A 492
7129        122 GSM=GSM+DMDG(I)                                                            831A 493
7130            GSMS=GSM                                                                   831A 494
7131            GSMT=GSMT+GSMS*ASU/AREA(1)*DTH                                             831A 495
7132            DCDT=(CPE(1)-COLD)/DTH                                                     831A 496
7133            DPDT=(CPE(2)-POLD)/DTH                                                     831A 497
7134      C                                                                                831A 498
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7135      C         CALCULATION OF IMPLICIT TEMPERATURE COEFFICIENTS                B31A 499
7136      C         AND INTERNAL ENERGY RATE TERMS                                  B31A 500
7137      C       MAIN BLOCK                                                        B31A 501
7138              DVB=0.                                                            B31A 502
7139              SOEGR=0.                                                          B31A 503
7140              GSEGR=0.                                                          B31A 504
7141              TB=0.                                                             B31A 505
7142              RAT(1)=2.*RAT(1)                                                  B31A 506
7143              CPNL=CP(NL)                                                       B31A 507
7144              NLM=NL-1                                                          B31A 508
7145              IMIN=0                                                            B31A 509
7146              DO 30 I=IMIN,NLM                                                  B31A 510
7147              IF (I) 15,15,14                                                   B31A 511
7148           14 GSM=GSM-DMDG(I)                                                   B31A 512
7149              DRODTD=-DMDG(I)/(RR(I)*DEL(I))                                    B31A 513
7150              FACT1=DTH/(DEL(I)*RR(I))                                          B31A 514
7151              FACT2=GSM/(DEL(I)*RR(I))                                          B31A 515
7152              A(I)=-FACT1*DVB                                                   B31A 516
7153              DVB=1.0/(0.5*(RAT(I)+RAT(I+1))+RC(I)/RR(I))                       B31A 517
7154              TERM2=RON(I)*CP(I)-DTH*(CPGAS*(DRODTD-FACT2)                      B31A 518
7155             1          -DSDT*RO1*CP1/DEL(I))                                 B31A 519
7156              TERM1=FACT1*DVB                                                   B31A 520
7157              B(I)=TERM2-A(I)+TERM1                                             B31A 521
7158              C(I)=-TERM1                                                       B31A 522
7159              D(I)=TA(I)*TERM2+(HGAS*DRODTD-HBAR*(RON(I)                        B31A 523
7160             1       -RO(I))/DTH-FACT2*HGAS-DSDT*RO1*H1/DEL(I))*DTH             B31A 524
7161           15 RO1=ROT(I+1)                                                      B31A 525
7162              X1=PETE-PET/RO1                                                   B31A 526
7163              CP1=CPV(I+1)*X1+CPC(I+1)*(1.0-X1)                                 B31A 527
7164              H1=HP(I+1)*X1+HC(I+1)*(1.0-X1)                                    B31A 528
7165              CP(I+1)=CPV(I+1)*X(I+1)+CPC(I+1)*(1.0-X(I+1))                     B31A 529
7166              TN=-RO1*HBAR+RO1*H1+T                                             B31A 530
7167              HBAR=PETE*HP(I+1)-PET/RHO(1)*HC(I+1)                              B31A 531
7168              T=-RO1*H1+RO1*HBAR                                                B31A 532
7169           20 CALL LOOK (2,TA(I+1),TT1,THG,0,0,0,HGAS,CPGAS,1)                  B31A 533
7170              HGAS=HGAS+DELHG                                                   B31A 534
7171              GSEGR=GSEGR+HGAS*DMDG(I+1)                                        B31A 535
7172              SOEGR=SOEGR+HBAR*DMDG(I+1)                                        B31A 536
7173              IF (I) 24,24,25                                                   B31A 537
7174           24 EGO=GSMS*HGAS                                                     B31A 538
7175              HW=HGAS                                                           B31A 539
7176              GO TO 30                                                          B31A 540
7177           25 TERM3=(-FACT2*CPGAS-DSDT*RO1*CP1/DEL(I))*DTH                      B31A 541
7178              C(I)=C(I)+TERM3                                                   B31A 542
7179              D(I)=D(I)+TA(I+1)*TERM3+(FACT2*HGAS+DSDT*RO1*H1/DEL(I))*DTH       B31A 543
7180              TB=TB-TN*DSDT*RR(I)                                               B31A 544
7181           30 CONTINUE                                                          B31A 545
7182              A(1)=DTH/DEL(1)                                                   B31A 546
7183              TT=TT+TB*DTH/AREA(1)*ASU                                          B31A 547
7184      C       NOW THE LAST ABLATING NODE REQUIRES DIFFERENT TREATMENT           B31A 548
7185              DRODTD=-DMDG(NL)/(RR(NL)*DEL(NL))                                 B31A 549
7186              FACT1=DTH/(DEL(NL)*RR(NL))                                        B31A 550
7187              A(NL)=-FACT1*DVB                                                  B31A 551
7188              DVB=1.0/(0.5*(RAT(NL)+RAT(NEM))+RC(NL)/RR(NL))                    B31A 552
7189              C(NL)=-FACT1*DVB                                                  B31A 553
7190              TERM2=RON(NL)*CP(NL)-(CPGAS*DRODTD+(DSDT/DEL(NL))*                B31A 554
7191             1         (RO (NL)*CPNL  -RO1*CP1))*DTH                          B31A 555
7192              B(NL)=TERM2-C(NL)-A(NL)                                           B31A 556
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7193          D(NL)=TA(NL)*TERM2+DTH*(HBAS*DROOTD-HBAR*(RCN(NL)-                  B31A 557
7194         1         RO(NL))/DTH+DSDT*(RO (NL)*H(NL)-RO1*H1)/DEL(NL))          B31A 558
7195      C     NOW FOR BACK UPS IF ANY                                           B31A 559
7196            K = NL                                                          B31A 560
7197            IF(NUMN-NBM) 60,40,40                                           B31A 561
7198         40 DO 50 I=NBM,NUMN                                                B31A 562
7199            K=K+1                                                           B31A 563
7200            FACT1=DTH/(DEL(I)*RR(I))                                        B31A 564
7201            A(K) = -FACT1*DVB                                               B31A 565
7202            DVB=1.0/(0.5*(RAT(I)+RAT(I+1))+RC(I)/RR(I))                     B31A 566
7203            C(K)=-FACT1*DVB                                                 B31A 567
7204            B(K)=RO(I)*CP(I)-C(K)-A(K)                                      B31A 568
7205         50 D(K)=TA(I)*RO(I)*CP(I)                                          B31A 569
7206      C     NOW IF THE LAST NODE WAS INSULATED WE MUST REPAIR LAST B AND C     B31A 570
7207         60 IF(HRES) 80,70,80                                               B31A 571
7208         70 B(K)=B(K)+C(K)                                                  B31A 572
7209            C(K)=0.                                                         B31A 573
7210      C     NOW BEFORE GAUSS REDUCTION REWRITE LAST LINE OF MATRIX             B31A 574
7211         80 D(K)=D(K)-C(K)*TRES                                             B31A 575
7212            L=K                                                             B31A 576
7213            DO 90 I=2,K                                                     B31A 577
7214            L=L-1                                                           B31A 578
7215            D(L)=D(L)-C(L)/B(L+1)*D(L+1)                                    B31A 579
7216         90 B(L)=B(L)-C(L)/B(L+1)*A(L+1)                                    B31A 580
7217            B(1)=B(1)/A(1)                                                  B31A 581
7218            D(1)=D(1)/A(1)                                                  B31A 582
7219            PGPU=EGO-GSEGR                                                  B31A 583
7220            PGPUT=PGPUT+PGPU*DTH/AREA(1)*ASU                                B31A 584
7221            DECOM=GSEGR-SOEGR                                               B31A 585
7222            DECOMT=DECOMT+DECOM*DTH/AREA(1)*ASU                             B31A 586
7223      C                                                                     B31A 587
7224      C     SURFACE BOUNDARY CONDITION PACKAGE                              B31A 588
7225        761 CALL SBCPKG                                                     B31A 589
7226      C                                                                     B31A 590
7227            IF(JCMA-2) 780,780,799                                          B31A 591
7228          780 IF(JCMA) 148,3000,148                                         B31A 592
7229          148 CONTINUE                                                      B31A 593
7230      C                                                                     B31A 594
7231      C     SHRINK (AND DROP) OF LAST ABLATING NODE                         B31A 595
7232      C                                                                     B31A 596
7233      C     DEL(NL)=DEL(NL)-DS (SEE INT DECOMP)                             B31A 597
7234            IF(DEL(NL)-DELM)149,149,150                                     B31A 598
7235          149 DRLP=DEL(NL)*RO(NL)*RR(NL)                                    B31A 599
7236            DRLCP=DRLP*CP(NL)                                               B31A 600
7237            NL=NL-1                                                         B31A 601
7238            RC(NL)=RC(NL+1)                                                 B31A 602
7239            DRL=DEL(NL)*RO(NL)*RR(NL)                                       B31A 603
7240            DRLC=DRL*CP(NL)                                                 B31A 604
7241            HAPHB=DRL*H(NL)+DRLP*H(NL+1)                                    B31A 605
7242            TOP1=DRL+DRLP                                                   B31A 606
7243            TOP2=DRLC+DRLCP                                                 B31A 607
7244            TOP3=DRLC*TA(NL) +DRLCP*TA(NL+1)                                B31A 608
7245            VOL=DEL(NL)*RR(NL)+DEL(NL+1)*RR(NL+1)                           B31A 609
7246            DEL(NL)=DEL(NL)+DEL(NL+1)                                       B31A 610
7247            RO(NL)=TOP1/VOL                                                 B31A 611
7248            CP(NL)=TOP2/TOP1                                                B31A 612
7249            TA(NL)=TOP3/TOP2                                                B31A 613
7250            H(NL)=HAPHB/TOP1                                                B31A 614
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7251            DELR=DEL(NL+1)*RR(NL+1)/VOL                                     B31A 615
7252            CZ=1.0-DELR                                                     B31A 616
7253            DZ=0.0                                                          B31A 617
7254            GZ=CZ                                                           B31A 618
7255            NZ=JF*NL-JFH                                                    B31A 619
7256            N=NZ-JF+1                                                       B31A 620
7257            K=N                                                             B31A 621
7258            FZ=DELR                                                         B31A 622
7259            EZ=GZ                                                           B31A 623
7260            GO TO 179                                                       B31A 624
7261         172 GZ=DZ+1.0                                                      B31A 625
7262         173 FZ=DZ-CZ                                                       B31A 626
7263            IF(K-NZ) 175,174,175                                            B31A 627
7264         174 GZ=DELR                                                        B31A 628
7265         175 K=K+1                                                          B31A 629
7266            CZ=CZ+GZ                                                        B31A 630
7267         176 EZ=CZ-DZ                                                       B31A 631
7268            IF(EZ)178,177,177                                               B31A 632
7269         177 ROA(N)=ROA(N)+FZ*ROA(K)                                        B31A 633
7270            ROB(N)=ROB(N)+FZ*ROB(K)                                         B31A 634
7271            ROC(N)=ROC(N)+FZ*ROC(K)                                         B31A 635
7272            IF(N-NZ) 171,150,171                                            B31A 636
7273         171 N=N+1                                                          B31A 637
7274         179 ROA(N)=ROA(K)*EZ                                               B31A 638
7275            ROB(N)=ROB(K)*EZ                                                B31A 639
7276            ROC(N)=ROC(K)*EZ                                                B31A 640
7277            GO TO 172                                                       B31A 641
7278         178 ROA(N)=ROA(N)+ROA(K)*GZ                                        B31A 642
7279            ROB(N)=ROB(N)+ROB(K)*GZ                                         B31A 643
7280            ROC(N)=ROC(N)+ROC(K)*GZ                                         B31A 644
7281            GO TO 173                                                       B31A 645
7282      C                                                                     B31A 646
7283         150 GO TO 410                                                      B31A 647
7284           1 RETURN                                                         B31A 648
7285         799 CONTINUE                                                       B31A 649
7286            RETURN                                                          B31A 650
7287            END                                                             B31A 651
7288      C832A                                                                 B32A 001
7289            SUBROUTINE INPOUT                                               B32A 002
7290            COMMON/CAMCOM/TLMC(20,10,2),TMG(20),TTS(20,10,2),TCHEM(20,10,2),  B32A 003
7291           1NLC(20),NHI(20),KHI(20),JCMA,IMG,IMC,NMG,                       B32A 004
7292           2TCH(2),TPR(2),TRAD(2),IAB                                       B32A 005
7293           3,TT2(20,2),THZ(20,2),TT1(30),THG(30),DM12(2),TA(35),DELHG,I1,I2,CMB32A 006
7294           4,CMD,BPRMG,KCM(10)                                              B32A 007
7295            EQUIVALENCE (NCLASS,JCMA)                                       B32A 008
7296            COMMON/LOOCOM/KOUT,IEX,DEN,VR,IMI(23),ILO(23),IR(23)            B32A 009
7297            COMMON/CMACOM/TEP(20,2), TCP(20, 2),TKP(20, 2)                  B32A 010
7298           3,RHO(2),MATL(33),DEL(39),SO(20),H(38),RC(38),RA(38),RECORD(36),  B32A 011
7299           4AREA(38),EMA(38),RAV(38),                                       B32A 012
7300           5ROA(152),ROB(152),ROC(152),                                     B32A 013
7301           6     TPI(38),VFZ,CMH,NPR,                                       B32A 014
7302           7LCT,NPG,II,N8M,NUMN,NL,       DELM,RFT,RHORA,RHORB,RHORC,TRA    B32A 015
7303           8CA,TRACB,TRACC,RHOOA,RHOOB,RHOOC,EA,EB,EC,BA,BB,BC,PSIA,PSIB,PSIC,B32A 016
7304           9TRACM,PET,PETE,RSV,ETA,OTPR3,OTPR2,OTPRT,TPR3,TPR2,TMZRO,TMFIN,MT B32A 017
7305            COMMON/CMACOM/EPSM,TRES,                                        B32A 018
7306           1YMMI,GAMA,OMG,NO,FJFH,FJFS,JF,JFMP,JFH,INPUT,      DTMIN,BRP,MCONV,B32A 019
7307           2INCH,DTMB,NN,NI,NOI,CHCRI,PYCRI,MCON,     NR,TX(38),F1(39),F2(30)  B32A 020
7308            COMMON/MISC/       BPRM,CNT,COLD,CP1,CPGAS,CPNL,CZ,DCOT,DECCb,  B32A 021
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7309        1DECONT,DELCR,DELR,DENOLD,DIDT,DNS,DPDT,DRLCP,DRLC,DRLP,DRL,DRCAC,  B32A  022
7310        2DROAT,DROBC,DROBT,DROCC,DRCCT,DRODTD,DSDT,DSI,DS,DSS,DTA,DTHC,DTHS B32A  023
7311        3,DTS,DVB,DZ,EGO,EZ,FACT1,FACT2,FA,FB,FC,FJF,FK,FZ,GSEGR,GSH,GSMT,  B32A  024
7312        4GZ,H1,HAPHB,HBAR,HGAS,HRES,IE,IMIN,I,IS,ISV,ITER,J1,J,KK,K,KT,L,   B32A  025
7313        5NDR,NLI,NLM,N,NZ,O,PGPU,PGPUT,POLD,PON,QLOSS,QLOSST,RD,RO1,ROO ,SA B32A  026
7314        6,SOEGR,TAS,TB,TERM1,TERM2,TERM3,THDS,TH,THPRT,TN,TOP1,TOP2,TOP ,T, B32A  027
7315        /TT,VOL,X1                                                          B32A  028
7316         EQUIVALENCE (DH1,DH12(1)),(DH2,DH12(2)),(TS,TA)                    B32A  029
7317         DIMENSION TNRY(20)                                                 B32A  030
7318       497 FORMAT(I2,3F10.5)                                                B32A  033
7319       498 FORMAT(//7X,66HTABLE OF OPTIONAL MASS-FRACTION FUNCTIONS FOR THERM B32A  034
7320        1AL CONDUCTIVITY/25X,23H= F1(X)*KP + F2(X)*KC//25X,1HX,12X,         B32A  035
7321        25HF1(X),10X,5HF2(X)//(13X,3(5X,F10.4)))                            B32A  036
7322       499 FORMAT(12A6)                                                     B32A  037
7323       502 FORMAT (6X12A6)                                                  B32A  038
7324       503 FORMAT(//24X31H---REACTION KINETIC EQUATION---/1H )              B32A  039
7325       504 FORMAT(15X67HDRHO/DTIME = GAMMA ( BA*EXP(-EA/T)RHOOA((RHOA-RHOWA)/B32A  040
7326        1RHOOA)**PSIA )/   21X56H+ GAMMA ( BB*EXP(-EB/T)RHOOB((RHOB-RHORB)/B32A  041
7327        2RHOOB)**PSIB )/ 19X58H+(1-GAMMA)( BC*EXP(-EC/T)RHOOC((RHOC-RHOPC)/B32A  042
7328        3RHOOC)**PSIC ))                                                    B32A  043
7329       505 FORMAT (24X32H---REACTION KINETIC CONSTANTS---/1H )              B32A  044
7330       506 FORMAT (11X8HREACTION2X4HRHO05X4HRHOR8X1HB7X3HPSI8X1HE6X6HT REAC/2B32A  045
7331        13X18H(LB/CU FT)6X7H(1/SEC)12X7H(DEG R)3X7H(DEG R))                 B32A  046
7332       507 FORMAT (14XA1,2X2F9.2,2XE10.4,F7.2,2XE10.4,F8.0)                 B32A  047
7333       510 FORMAT(12X31HRESIN VOLUME FRACTION, GAMMA = F5.3,17H(MASS FRACTION B32A  048
7334        1 = F5.3,1H)/1H )                                                   B32A  049
7335       511 FORMAT (24X32H---TIME INCREMENT INFORMATION---/1H )              B32A  050
7336       512 FORMAT (6X18HINITIAL TIME (SEC)F7.3,26X16HFINAL TIME (SEC)F7.2)  B32A  051
7337       513 FORMAT (1H /6X17HOUTPUT INTERVAL =F6.3,1X27HSEC FROM INITIAL TIME B32A  052
7338        1UNTIL F7.3,4H SEC)                                                 B32A  053
7339       514 FORMAT (6X17HOUTPUT INTERVAL =F6.3,1X8HSEC FROMF7.3,1X9HSEC UNTILF B32A  054
7340        17.3,4H SEC)                                                        B32A  055
7341       515 FORMAT (6X17HOUTPUT INTERVAL =F6.3,1X8HSEC FROMF7.3,1X20HSEC UNTIL B32A  056
7342        1 FINAL TIME/1H )                                                   B32A  057
7343       516 FORMAT (6X,19HMAXIMUM TIME STEP =,F4.2,8H SECONDS)               B32A  058
7344       517 FORMAT(/29X16H---NODAL DATA---/1H )                              B32A  059
7345       518 FORMAT(6X74HNODE  MATL  TEMPERATURE  RELATIVE  THICKNESS  NODAL DE B32A  060
7346        1PTH  CONT.RESISTANCE)                                              B32A  061
7347       519 FORMAT(7X73HNO.   NO. (DEG.RANKINE)   AREA    (INCHES)    (INCHES) B32A  062
7348        1   (SQFT-S-DEG/BTU))                                               B32A  063
7349       520 FORMAT(3X2I6,F12.2,E13.4,F9.5,F12.6,A1,E15.4)                    B32A  064
7350       521 FORMAT (    14X47HMINIMUM THICKNESS OF LAST ABLATOR NODE (INCHES)F B32A  065
7351        17.4/14X,10HTHERE ARE ,I2,40H NODELETS ASSIGNED TO EACH ABLATING NO B32A  066
7352        2DE)                                                                B32A  067
7353       522 FORMAT(/18X48H---HEAT OF FORMATION OF MATERIAL CONSTITUENTS---//1X B32A  068
7354        18H(BTU/LB)/21X7HPLASTIC11X4HCHAR17X3HGAS/                          B32A  069
7355       523 FORMAT (20XF9.2,7XF9.2,11XF9.2)                                  B32A  070
7356       524 FORMAT(/7X28HENTHALPY DATUM TEMPERATURE =F9.3,1X11HDEG RANKINE)   B32A  071
7357       525 FORMAT    (//22X36H---MATERIAL THERMAL PROPERTY DATA---//6X14HMATER B32A  072
7358        1IAL NO. 1 8X14HMATERIAL NO. 2 8X26HMATERIAL NOS. 3 THROUGH 10/6X14 B32A  073
7359        2HVIRGIN PLASTIC15X4HCHAR23X7HBACK-UP)                              B32A  074
7360       526 FORMAT(/6X12HMATERIAL NO.I2,3BX9HDENSITY =F8.3,1X8HLB/CU FT/      B32A  075
7361        1         7X11HTEMPERATURES3X13HSPECIFIC HEATS3X12HCONDUCTIVITY5X8HEMI B32A  076
7362        2SIBLE4X18HEMISSIVITY/50X8HENTHALPY/9X7H(DEG R)7X12H(BTU/LB-DEG)4X1HK B32A  077
7363        36H(BTU/FT-SEC-DEG)3X8H(BTU/LB)/                                    B32A  078
7364        4         (8XF8.2,8XF7.4,9XF10.7,7XF9.2,4XF7.4))                    B32A  079
7365       527 FORMAT(/6X12HMATERIAL NO.I2,38X9HDENSITY =F8.3,1X8HLB/CU FT/      B32A  080
7366        1         7X11HTEMPERATURES3X13HSPECIFIC HEATS3X12HCONDUCTIVITY/9X7H(D B32A  081
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7367          2EG R)7X12H(BTU/LB-DEG)4X16H(BTU/FT-SEC-DEG)/                    B32A 082
7368         3       (8XF8.2,8XF7.4,9XF10.7))                                  B32A 083
7369       528 FORMAT(39H  BAD SURFACE STATE TABLE  --  QUIT JOB  )            B32A 084
7370       531 FORMAT (1H /6X19HTEI ERATURE (DEG R)5F11.2)                     B32A 085
7371       532 FORMAT    (//20X47H---RESIN DECOMPOSITION GAS SENSIBLE ENTHALPY---)B32A 086
7372       533 FORMAT      (6X19HENTHALPY   (BTU/LB)5F11.2)                    B32A 087
7373       534 FORMAT (1H //23X40H---TIME DEPENDENT BOUNDARY CONDITIONS---/1H ) B32A 088
7374       535 FORMAT (9X,4HTIME,8X,4HPROB,3X,8HRECOVERY,3X,9HRADIATION,4X,4HHEATB32A 089
7375          15X,8HPRESSURE,3X,7HBLOWING/9X,5H(SEC),7X,4HOPTN,3X,8HENTHALPY,3X, B32A 090
7376          29HHEAT RATE,4X,5HCOEFF,14X,9HREDUCTION/28X,8H(BTU/LB),2X,11H(BTU/SB32A 091
7377          3Q FT-,1X,10H(LB/SQ FT-,3X,5H(ATM),3X,9HPARAMETER /40X,7HSECOND),  B32A 092
7378          44X,7HSECOND))                                                    B32A 093
7379       536 FORMAT (6X,F8.2,8X,I2,4X,2(F8.2,3X),F8.4,3X,F8.5,3X,F8.3)       B32A 094
7380       537 FORMAT (1H /9X,69HCH/CHO = PHI/(EXP(PHI)-1.) WHERE PHI = 2.*BRP*M B32A 095
7381          1DOT/CHO. BRP IN TABLE)                                           B32A 096
7382       538 FORMAT(//27X30H---SURFACE EQUILIBRIUM DATA---)                   B32A 097
7383       539 FORMAT (1H /6X12HM DOT G/CM =F7.4/1H )                          B32A 098
7384       540 FORMAT(2(7X4HTEMP8X3HLOG7X9H(H WALL).3X)/2(6X7H(DEG R)3X10HM-DOT-GB32A 099
7385          1/CM2X11H(1+B PRIME)2X)/2(29X8H(BTU/LB)4X))                       B32A 100
7386       541 FORMAT (5XF8.2,4XF7.4,5XF9.2,8XF8.2,4XF7.4,5XF9.2)              B32A 101
7387       551 FORMAT(1H110X65HAEROTHERM CHARRING MATERIAL THERMAL RESPONSE AND AB32A 102
7388          1BLATION PROGRAM/73X4HPAGEI3/1H 67X2A6)                           B32A 103
7389       552 FORMAT (9X,4HTIME,8X,4HPROB,3X,7HSURFACE,4X,7HSURFACE/9X,5H(SEC), B32A 104
7390          17X,4HOPTN,5X,4HTEMP,5X,9HRECESSION/28X,7H(DEG R),6X,4HRATE/38X,   B32A 105
7391          210H(MILS/SEC))                                                   B32A 106
7392       553 FORMAT(8X24H*INITIAL INTERNAL RADIUS,1X,F6.3,4X,21HAREA PROP.TO RAB32A 107
7393          1DIUS**F4.2)                                                      B32A 108
7394       554 FORMAT(8X24H*INITIAL EXTERNAL RADIUS,1X,F6.3,4X,21HAREA PROP.TO RAB32A 109
7395          1DIUS**F4.2)                                                      B32A 110
7396       555 FORMAT(8X15H*PLANAR SURFACE)                                    B32A 111
7397       556 FORMAT (9X,4HTIME,8X,4HPROB,5X,4HVIEW,5X,9HRADIATION/9X,5H(SEC), B32A 112
7398          17X,4HOPTN,4X,6HFACTOR,4X,9HHEAT RATE/38X,11H(BTU/SQ FT-/40X,     B32A 113
7399          27HSECOND))                                                       B32A 114
7400       560 FORMAT(I2,5E10.0)                                               B32A 115
7401       561 FORMAT (I2,F8.4)                                                B32A 116
7402       563 FORMAT (I2,I3,I1,I2,I2,7F10.5/8F10.5)                           B32A 117
7403       564 FORMAT (A1,9X2F10.5,E10.3,F10.5,E10.3,F10.5)                    B32A 118
7404       571 FORMAT(I2,F10.5,F10.5,F10.8,F10.5)                              B32A 119
7405       575 FORMAT(I1,F9.5,7F10.5/8F10.5)                                   B32A 120
7406       577 FORMAT(I1,F9.5,5F10.5)                                          B32A 121
7407       578 FORMAT(12X2E12.5,2E13.6,I1)                                     B32A 122
7408      5790 FORMAT (6X,26HNO RADIUS CORRECTION ON CH)                       B32A 123
7409      5791 FORMAT (3F8.5,F9.4,F5.3,2F9.3,I2,A6)                            B32A 124
7410      5792 FORMAT(//6X,3HP =,F9.4,4H ATM//6X,3(25HTEMPERATURE  EDGE ENTH   )/B32A 125
7411         16X,3(25H  (DEG R)    AT T-WALL   ))                             B32A 126
7412      5793 FORMAT (//6X,37HBAD SURFACE EQUILIBRIUM TABLE OF TYPE,I2)       B32A 127
7413      5794 FORMAT (//6X,74HEQUAL MASS AND HEAT TRANSFER COEFFICIENTS AND EQUAB32A 128
7414         1L DIFFUSION COEFFICIENTS/6X,29HNOMINAL SURFACE VIEW FACTOR =,     B32A 129
7415         2F6.3)                                                            B32A 130
7416      5789 FORMAT(//6X,14HM-DOT-GAS/CM =,F7.4,8X,10HPRESSURE =,F9.4,4H ATM// B32A 131
7417         17X,2(4HTEMP,5X,26HM-DOT-  CHEM.PROD  SURFACE,3X)/6X,2(36H(DEG R)  B32A 132
7418         2CHAR/CM   (BTU/LB)  SPECIES,2X))                                 B32A 133
7419      5795 FORMAT(5X,F8.2,2X,F7.4,2X,F8.2,4X,A6,1X,F8.2,2X,F7.4,2X,F8.2,4X,A6B32A 134
7420         1)                                                                B32A 135
7421      5796 FORMAT (2F10.0,9X,I1)                                          B32A 136
7422      5797 FORMAT(//6X,45HRATIO OF MASS TO HEAT TRANSFER COEFFICIENTS =,F6.3/B32A 137
7423         1 6X,28HUNEQUAL DIFFUSION EXPONENT =,F6.3/6X,29HNOMINAL SURFACE VIEB32A 138
7424         2W FACTOR =,F6.3,11H (OPTION 1))                                  B32A 139
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7425      5798 FORMAT                                (6X,F9.2,4X,F9.2,3X,F9.2,4X,F9.B32A 140
7426          22,3X,F9.2,4X,F9.2)                                                   B32A 141
7427      5799 FORMAT (6X,66HHEAT TRANSFER COEFFICIENT MULTIPLIED BY (R INITIAL/RB32A 142
7428          1 CURRENT)**1.8)                                                      B32A 143
7429       580 FORMAT (8F10.5)                                                      B32A 144
7430       581 FORMAT(/14X20HBACK WALL CONVECTION10X9HBACK WALL10X9HRESERVOIR/     B32A 145
7431          113X23HCOEF BTU/FTSQ-SEC-DEG R8X10HEMISSIVITY8X11HTEMPERATURE/      B32A 146
7432          217XF10.4,18XF6.3,10XF10.2)                                         B32A 147
7433       582 FORMAT(5F10.5,9X,I1)                                                B32A 148
7434           DATA  BLANK,ASTER/ 1H ,1H*/                                        B32A 149
7435           KOUT=5                                                             B32A 150
7436           INPUT=8                                                            B32A 151
7437           NMG=0                                                              B32A 152
7438           INCH=8                                                             B32A 153
7439           WT=0.0                                                             B32A 154
7440      C    INPUT/OUTPUT                                                       B32A 155
7441      C                                                                       B32A 156
7442          1 NPG=1                                                            B32A 157
7443           WRITE (KOUT,551)NPG                                               B32A 158
7444           READ  (INPUT,499)(RECORD(I),I=1,36)                               B32A 159
7445      C                                                          EUNITNB32A 160
7446      C                                                            FOB32A 161
7447      C                                                8999,9999 )TUPNI,FOE(B32A 162
7448           WRITE (KOUT,502)(RECORD(I),I=1,36)                                B32A 163
7449           WRITE (KOUT,503)                                                  B32A 164
7450           WRITE (KOUT,504)                                                  B32A 165
7451           WRITE (KOUT,505)                                                  B32A 166
7452           WRITE (KOUT,506)                                                  B32A 167
7453           READ  (INPUT,564)A9,RHOOA,RHORA,BA,PSIA,EA,TRACA,B9,RHOOB ,RHORB,BB32A 168
7454          1B,PSIB,EB,TRACB ,C9,RHOOC,RHORC,BC, PSIC,EC,TRACC                 B32A 169
7455           WRITE (KOUT,507)A9,RHOOA,RHORA,BA,PSIA,EA,TRACA,B9,RHOOB,RHORB,BB,B32A 170
7456          1PSIB,EB,TRACB ,C9,RHOOC,RHORC,BC, PSIC,EC,TRACC                   B32A 171
7457           READ (INPUT,563) JF,NUMN,NN,NO,NI,THZRO,THFIN,DTPRT,DTPR2,DTPR3,  B32A 172
7458          1DTHB,BRP,TPR2,TPR3,DELM,DH1,DH2,DELHG,GAMA,TZ                     B32A 173
7459           IF(JF-1) 171,170,172                                              B32A 174
7460       170 JF=2                                                              B32A 175
7461           GO TO 172                                                         B32A 176
7462       171 JF=10                                                             B32A 177
7463       172 JFH=JF/2                                                          B32A 178
7464           JF=JFH+JFH                                                        B32A 179
7465           JFHP=JFH+1                                                        B32A 180
7466           FJFS=JF                                                           B32A 181
7467           FJFH=FJFS/2.0                                                     B32A 182
7468           NOI=NO+NI                                                         B32A 183
7469           IF (NO) 181,181,182                                               B32A 184
7470       182 READ  (INPUT,580)(SO(I),I=1,NO)                                   B32A 185
7471       181 CONTINUE                                                          B32A 186
7472           IF (NI) 184,184,183                                               B32A 187
7473       183 NOP=NO+1                                                          B32A 188
7474           READ (INPUT,580) (SO(I), I=NOP,NOI)                               B32A 189
7475       184 IF(GAMA) 408,409,409                                              B32A 190
7476       408 GAMA=RHOOC/(RHOOC-(RHOOA+RHOOB)-(RHOOA+RHOOE)/GAMA)               B32A 191
7477       409 OMG=1.0-GAMA                                                      B32A 192
7478           RHO(1)=GAMA*(RHOOA+RHOOB)+OMG*RHOOC                               B32A 193
7479           RHO(2)=GAMA*(RHORA+RHORB)+OMG*RHORC                               B32A 194
7480            GAMAM=GAMA/RHO(1)*(RHOOA+RHOOB)                                  B32A 195
7481           WRITE (KOUT,510)GAMA,GAMAM                                        B32A 196
7482           IF(DTHB) 412,410,412                                              B32A 197
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7483        410 DTHB=5.                                                                    B32A 198
7484        412 DTHIN=.01                                                                  B32A 199
7485        413 IF(TPR2)414,414,415                                                        B32A 200
7486        414 TPR2=THFIN                                                                 B32A 201
7487        415 IF(TPR3)416,416,417                                                        B32A 202
7488        416 TPR3=THFIN                                                                 B32A 203
7489            IF(TPR2-THZRO) 418,418,417                                                 B32A 204
7490        418 DTPRT=DTPR2                                                                B32A 205
7491            DTPR2=DTPR3                                                                B32A 206
7492            TPR2=TPR3                                                                  B32A 207
7493            GO TO 416                                                                  B32A 208
7494        417 WRITE (KOUT,511)                                                           B32A 209
7495            THFIN=AMAX1(THFIN,TPR2,TPR3)                                               B32A 210
7496            WRITE (KOUT,512)THZRO,THFIN                                                B32A 211
7497            WRITE (KOUT,513)DTPRT,TPR2                                                 B32A 212
7498            WRITE (KOUT,514)DTPR2,TPR2,TPR3                                            B32A 213
7499            WRITE (KOUT,515)DTPR3,TPR3                                                 B32A 214
7500            WRITE (KOUT,516) DTHB                                                      B32A 215
7501      C481                                    )CCART,BCART,ACART(F1NIM=MCA             B32A 216
7502            TRACM=AMIN1(TRACA,TRACB,TRACC)                                             B32A 217
7503            PETE=RHO(1)/(RHO(1)-RHO(2))                                                B32A 218
7504            PET=PETE*RHO(2)                                                            B32A 219
7505      C     ----------  NODAL PROPERTIES                                              B32A 220
7506            N=0                                                                        B32A 221
7507            J1=JFH                                                                     B32A 222
7508            CALL LCOUNT (-NUMN-8,LCT,NPG,RECORD(35))                                   B32A 223
7509        302 WRITE (KOUT,517)                                                           B32A 224
7510            WRITE (KOUT,518)                                                           B32A 225
7511            WRITE (KOUT,519)                                                           B32A 226
7512            B=ASTER                                                                    B32A 227
7513            READ(INPUT,560)(MATL(I),TA(I),AREA(I),DEL(I),RA(I),RC(I),I=1,NUMN)         B32A 228
7514            AE=RA(2)                                                                   B32A 229
7515            RSV=RA(1)                                                                  B32A 230
7516            RA(1)=0.0                                                                  B32A 231
7517            DO 400 I=1,NUMN                                                            B32A 232
7518            IF(I-2) 4541,452,453                                                       B32A 233
7519        453 RA(I)=RA(I-1)+(DEL(I-1)+DEL(I))/2.0                                        B32A 234
7520            GO TO 461                                                                  B32A 235
7521        452 RA(2)=DEL(1)+DEL(2)/2.                                                     B32A 236
7522            B=BLANK                                                                    B32A 237
7523        461 DEL(I-1)=DEL(I-1)/12.                                                      B32A 238
7524       4541 RAV(I)=RA(I)                                                               B32A 239
7525            IF(AE) 4542,4543,4542                                                      B32A 240
7526       4542 AREA(I)=(ABS(RSV+RA(I)))**AE                                               B32A 241
7527            GO TO 454                                                                  B32A 242
7528       4543 IF(AREA(I)) 4544,4544,454                                                  B32A 243
7529       4544 IF(RSV) 4545,4546,4545                                                     B32A 244
7530       4545 AREA(I)=ABS(RSV+RA(I))                                                     B32A 245
7531            AE=1.0                                                                     B32A 246
7532            GO TO 454                                                                  B32A 247
7533       4546 AREA(I)=1.                                                                 B32A 248
7534        454 WRITE(KOUT,520)I,MATL(I),TA(I),AREA(I),DEL(I),RA(I),B,RC(I)                B32A 249
7535            IF(MATL(I)-2) 401,405,400                                                  B32A 250
7536        401 NL=I                                                                       B32A 251
7537            DO 404 J=1,J1                                                              B32A 252
7538            N=N+1                                                                      B32A 253
7539            ROA(N)=RHOOA                                                               B32A 254
7540            ROB(N)=RHOOB                                                               B32A 255
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7541        404 ROC(N)=RHOOC                                                    B32A 256
7542            J1=JF                                                           B32A 257
7543            GO TO 400                                                       B32A 258
7544        405 NL=I                                                            B32A 259
7545            DO 406 J=1,J1                                                   B32A 260
7546            N=N+1                                                           B32A 261
7547            ROA(N)=RHORA                                                    B32A 262
7548            ROB(N)=RHORB                                                    B32A 263
7549        406 ROC(N)=RHORC                                                    B32A 264
7550            J1=JF                                                           B32A 265
7551        400 CONTINUE                                                        B32A 266
7552        403 DEL(NUMN)=DEL(NUMN)/12.                                         B32A 267
7553            CALL SLOPC(NUMN,RA,AREA,EMA,EMA)                                B32A 268
7554            NBM=NL+1                                                        B32A 269
7555            IF(RSV) 4031,4032,4033                                          B32A 270
7556       4031 RSVN=-RSV                                                       B32A 271
7557            WRITE(KOUT,554)RSVN,AE                                          B32A 272
7558            GO TO 304                                                       B32A 273
7559       4032 WRITE(KOUT,555)                                                 B32A 274
7560            GO TO 304                                                       B32A 275
7561       4033 WRITE(KOUT,553)RSV,AE                                           B32A 276
7562        304 WRITE (KOUT,521) DELM,JF                                        B32A 277
7563            DELM=DELM/12.0                                                  B32A 278
7564            READ(INPUT,582) HCONV,EPSW,TRES,CHCRI,PYCRI,NCON                B32A 279
7565            IF (CHCRI) 305,305,306                                          B32A 280
7566        305 CHCRI=0.02                                                      B32A 281
7567        306 IF (PYCRI) 307,307,308                                          B32A 282
7568        307 PYCRI=0.98                                                      B32A 283
7569        308 TA(NUMN+1)=TRES                                                 B32A 284
7570            CALL LCOUNT(4              ,LCT,NPG,RECORD(35))                 B32A 285
7571            WRITE(KOUT,581) HCONV,EPSW,TRES                                 B32A 286
7572            CALL LCOUNT(5              ,LCT,NPG,RECORD(35))                 B32A 287
7573            WRITE (KOUT,522)                                                B32A 288
7574            WRITE (KOUT,523)DH1,DH2,DELHG                                   B32A 289
7575            CALL LCOUNT(2              ,LCT,NPG,RECORD(35))                 B32A 290
7576            WRITE (KOUT,524)TZ                                              B32A 291
7577      C     --------- MATERIAL PROPERTIES                                   B32A 292
7578            CALL LCOUNT(6              ,LCT,NPG,RECORD(35))                 B32A 293
7579        310 WRITE (KOUT,525)                                                B32A 294
7580            IT=0                                                            B32A 295
7581            ILO(3)=1                                                        B32A 296
7582            ILO(4)=1                                                        B32A 297
7583            KT=1                                                            B32A 298
7584        350 IT=IT+1                                                         B32A 299
7585            READ (INPUT,571) NC,TT2(IT,KT),TCP(IT,KT),TKP(IT,KT),TEP(IT,KT) B32A 300
7586            IF(NC)351,350,351                                               B32A 301
7587        351 IHI(KT+2)=ILO(KT+2)+IT-1                                        B32A 302
7588            IR(KT+2)=ILO(KT+2)                                              B32A 303
7589            THZ(1,KT)=0.                                                    B32A 304
7590            IF (IT-2) 2357,1357,1357                                        B32A 305
7591       1357 DO 357 I=2,IT                                                   B32A 306
7592        357 THZ(I,KT)=THZ(I-1,KT)+(TCP(I,KT)+TCP(I-1,KT))/2.*(TT2(I,KT)-TT2(I-B32A 307
7593           11,KT))                                                          B32A 308
7594       2357 CONTINUE                                                        B32A 309
7595            CALL LOOK (KT+2,TZ,TT2(1,KT),THZ(1,KT),0,0,0,HSH,DUM,1)         B32A 310
7596            DO 359 I=1,IT                                                   B32A 311
7597        359 THZ(I,KT)=THZ(I,KT)-HSH                                         B32A 312
7598            CALL LCOUNT(6+IT           ,LCT,NPG,RECORD(35))                 B32A 313
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7599        312 IF (IT-1) 2312,1312,1312                                                    B32A 314
7600       1312 WRITE(KOUT,526)KT,RHO(KT),(TT2(I,KT),TCP(I,KT),TKP(I,KT),THZ(I,KT)B32A 315
7601           1,TEP(I,KT),I=1,IT)                                                         B32A 316
7602       2312 CONTINUE                                                                   B32A 317
7603            KT=KT+1                                                                    B32A 318
7604            IT=0                                                                       B32A 319
7605            IF(NC) 356,353,353                                                         B32A 320
7606        356 IF(KT-2) 350,350,411                                                       B32A 321
7607        411 READ (INPUT,561) KT,RHO(KT)                                                B32A 322
7608            IF (RHO(KT)) 3550,3550,355                                                 B32A 323
7609       3550 WT=1.0                                                                     B32A 324
7610            IX=0                                                                       B32A 325
7611       3551 IX=IX+1                                                                    B32A 326
7612            READ (INPUT,497) NC,TX(IX), F1(IX),F2(IX)                                  B32A 327
7613            IF (NC) 3552,3551,3552                                                     B32A 328
7614       3552 ILO(11)=1                                                                  B32A 329
7615            IHI(11)=IX                                                                 B32A 330
7616            IR(11)=1                                                                   B32A 331
7617            CALL LCOUNT(8+IX,LCT,NPG,RECORD(35))                                       B32A 332
7618            IF (IX-1) 6001,6000,6000                                                   B32A 333
7619       6000 WRITE(KOUT,498) (TX(I),F1(I),F2(I),I=1,IX)                                 B32A 334
7620       6001 CONTINUE                                                                   B32A 335
7621            IF (NC) 411,411,353                                                        B32A 336
7622        355 IT=IT+1                                                                    B32A 337
7623            READ (INPUT,571) NC,TT2(IT,KT),TCP(IT,KT),TKP(IT,KT)                      B32A 338
7624            IF(NC) 354,355,354                                                         B32A 339
7625        354 ILO(KT+2)=1                                                                B32A 340
7626            IHI(KT+2)=ILO(KT+2)+IT-1                                                   B32A 341
7627            IR(KT+2)=ILO(KT+2)                                                         B32A 342
7628            CALL LCOUNT(5+IT          ,LCT,NPG,RECORD(35))                             B32A 343
7629        314 IF (IT-1) 2314,1314,1314                                                   B32A 344
7630       1314 WRITE (KOUT,527) KT,RHO(KT),(TT2(I,KT),TCP(I,KT),TKP(I,KT),I=1,IT)B32A 345
7631       2314 CONTINUE                                                                   B32A 346
7632            IT=0                                                                       B32A 347
7633            IF(NC) 411,411,353                                                         B32A 348
7634       C    ----------  PYROLYSIS GAS ENTHALPY                                        B32A 349
7635        353 NT1=0                                                                      B32A 350
7636        361 IN=1+NT1                                                                   B32A 351
7637            NT1=8+NT1                                                                  B32A 352
7638            IF (NT1-IN) 6003,6002,6002                                                 B32A 353
7639       6002 READ  (INPUT,575)NC,(TT1(I),I=IN,NT1),(THG(I),I=IN,NT1)                   B32A 354
7640       6003 CONTINUE                                                                   B32A 355
7641            IF(NC)361,361,362                                                          B32A 356
7642        364 NT1=NT1-1                                                                  B32A 357
7643        362 IF(TT1(NT1)) 364,364,365                                                   B32A 358
7644        365 ILO(2)=1                                                                   B32A 359
7645            IR(2)=1                                                                    B32A 360
7646            IHI(2)=NT1                                                                 B32A 361
7647            CALL LCOUNT(3*((NT1+9)/5),LCT,NPG,RECORD(35))                              B32A 362
7648        316 WRITE (KOUT,532)                                                           B32A 363
7649            IFN=0                                                                      B32A 364
7650        368 IN=IFN+1                                                                   B32A 365
7651            IFN=MIN0(NT1,IFN+5)                                                        B32A 366
7652            IF (IFN-IN) 6005,6004,6004                                                 B32A 367
7653       6004 WRITE (KOUT,531)(TT1(I),I=IN,IFN )                                         B32A 36
7654            WRITE (KOUT,533)(THG(I),I=IN,IFN)                                          B32A 369
7655       6005 CONTINUE                                                                   B32A 370
7656            IF(NT1-IFN) 367,367,368                                                    B32A 371
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      367 K=1                                                                B32A 372
     2803 READ(INPUT,583) BPG,(TNRY(I),I=1,19)                               B32A 373
          IF(TNRY(1)) 2804,2804,2805                                         B32A 374
     2805 TMG(K)=BPG                                                         B32A 375
          DO 2802 I=1,19                                                     B32A 376
          IF(TNRY(I)-99.) 2800,2800,2801                                     B32A 377
     2801 TTS(I,K,1)=TNRY(I)                                                 B32A 378
          KHI(K)=I                                                           B32A 379
          NHI(K)=I
          GO TO 2802                                                         B32A 380
     2800 IF(TNRY(I)) 2811,2802,2810                                         B32A 381
     2810 TLMC(I,K,1) = TNRY(I)                                              B32A 382
          NHI(K)=I                                                           B32A 383
     2802 CONTINUE                                                           B32A 384
     2811 K=K+1                                                              B32A 385
          GO TO 2803                                                         B32A 386
     2804 NMG=K-1                                                            B32A 387
          IHI(12)=NMG                                                        B32A 388
          ILO(12)=1                                                          B32A 389
          IR(12)=1                                                           B32A 390
          DO 2818 K=1,NMG
          NLO(K)=KHI(K)+1                                                    B32A 392
          KHIK=KHI(K)                                                        B32A 393
          NLOK=NLO(K)                                                        B32A 394
          NHIK=NHI(K)                                                        B32A 395
          DO 2807 I=1,KHIK                                                   B32A 396
     2807 TTS(I,K,2)=TTS(I,K,1)                                              B32A 397
          IF(NHIK-NLOK) 2818,2809,2809
     2809 DO 2808 I=NLOK,NHIK
          TLMC(I,K,1)=ALOG(AMAX1(TLMC(I,K,2),.00001))                        B32A 399
     2808 TLMC(I,K,2)=TLMC(I,K,1)                                            B32A 400
     2818 CONTINUE
      583 FORMAT(20F4.0)                                                     B32A 401
          VFZ=1.0
          IF(BPG.GT.0.) VFZ=BPG
          RETURN
          END
    CB33A                                                                    B33A 001
          SUBROUTINE LOOK(II,XL,X,A,B,C,E,Y,D,IDN)                           B33A 002
          COMMON/LOGCOM/KOUT,IEX,DEN,VR,IHI(23),ILO(23),IR(23)               B33A 003
          DIMENSION  X(1),Y(1),D(1)                                          B33A 004
          DIMENSION A(1),B(1),C(1),E(1)                                      B33A 005
          IH=IHI(II)                                                         B33A 006
          IL=ILO(II)                                                         B33A 007
          IEX=0                                                              B33A 008
          IF(X(IH)-X(IL)) 30,30,29                                           B33A 009
       30 IEX=1                                                              B33A 010
          IF (XL-X(IH)) 3,2,31                                               B33A 011
       31 IF (XL-X(IL)) 6,5,4                                                B33A 012
       29 IF(XL-X(IH))1,2,3                                                  B33A 013
        1 IF(XL-X(IL))4,5,6                                                  B33A 014
        6 I=IR(II)                                                           B33A 015
          I=MIN0(I,IH)                                                       B33A 016
          I=MAX0(I,IL)                                                       B33A 017
          IS=1                                                               B33A 018
          IT=1                                                               B33A 019
          GO TO 8                                                            B33A 020
       11 I=I+1                                                              B33A 021
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7715            IS=0                                                    B33A 022
7716          8 IF(IEX) 28,28,38                                        B33A 023
7717         28 IF(XL-X(I)) 7,10,9                                      B33A 024
7718         38 IF(XL-X(I)) 9,10,7                                      B33A 025
7719          7 I=I-1                                                   B33A 026
7720            IT=0                                                    B33A 027
7721            IF(IS)10,10,8                                           B33A 028
7722          9 IF(IT)10,10,11                                          B33A 029
7723          3 IEX=3                                                   B33A 030
7724          2 I=IH-1                                                  B33A 031
7725            GO TO 10                                                B33A 032
7726          4 IEX=2                                                   B33A 033
7727          5 I=IL                                                    B33A 034
7728         10 DEN=X(I+1)-X(I)                                         B33A 035
7729            IR(II)=I                                                B33A 036
7730            VR=XL-X(I)                                              B33A 037
7731            IF(IDN) 13,13,14                                        B33A 038
7732         14 GO TO (21,22,23,24),IDN                                 B33A 039
7733         24 Y(4)=E(I)                                               B33A 040
7734            D(4)=E(I+1)-E(I)                                        B33A 041
7735         23 Y(3)=C(I)                                               B33A 042
7736            D(3)=C(I+1)-C(I)                                        B33A 043
7737         22 Y(2)=B(I)                                               B33A 044
7738            D(2)=B(I+1)-B(I)                                        B33A 045
7739         21 Y(1)=A(I)                                               B33A 046
7740            D(1)=A(I+1)-A(I)                                        B33A 047
7741            DO 12  J=1,IDN                                          B33A 048
7742         20 D(J)=D(J)/DEN                                           B33A 049
7743         12 Y(J)=Y(J)+D(J)*VR                                       B33A 050
7744         13 VR=VR/DEN                                               B33A 051
7745            RETURN                                                  B33A 052
7746            END                                                     B33A 053
7747      CB34A                                                         B34A 001
7748            SUBROUTINE COMP(X,Y,VOID,IFLAG)
7749            DIMENSION Y(20,10,2)
7750            DIMENSION X(20,10,2)                                    B34A 003
7751            IFLAG=0                                                 B34A 004
7752            DO 3 I=1,2                                              B34A 005
7753            DO 3 K=1,2                                              B34A 007
7754            IF(Y(I,1,K)-VOID) 1,2,1
7755          1 IF(X(I,1,K)-VOID) 3,2,3
7756          3 CONTINUE                                                B34A 009
7757            GO TO 4                                                 B34A 010
7758          2 IFLAG=1                                                 B34A 011
7759          4 RETURN                                                  B34A 012
7760            END                                                     B34A 013
7761      CB36A                                                         B36A 001
7762            SUBROUTINE OGLE(N,XAM,PRM,NUMX,X,P,EM)                  B36A 002
7763            DIMENSION XAM(1),X(1),P(1),EM(1),PRM(1),DPDIM(1)        B36A 003
7764            XDIF=X(NUMX)-X(1)                                       B36A 004
7765            IS=1                                                    B36A 005
7766          2 DO 600 J=1,N                                            B36A 006
7767            XA=XAM(J)                                               B36A 007
7768         59 IO=1                                                    B36A 008
7769            IT=1                                                    B36A 009
7770         61 IF(XDIF) 72,60,71                                       B36A 010
7771         71 IF(XA-X(IS)) 62,63,64                                   B36A 011
7772         72 IF(X(IS)-XA) 62,63,64                                   B36A 012
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7773          62 IF(IS-1)671,671,68                                                    B36A 013
7774          68 IS=IS-1                                                               B36A 014
7775             IT=2                                                                  B36A 015
7776             GO TO (61,66),IO                                                      B36A 016
7777         672 IS=NUMX                                                               B36A 017
7778         671 I=IS                                                                  B36A 018
7779             H=0.                                                                  B36A 019
7780             DPDI=EM(I)                                                            B36A 020
7781             GO TO 67                                                              B36A 021
7782          63 PR=P(IS)                                                              B36A 022
7783             DPDI=EM(IS)                                                           B36A 023
7784             GO TO 601                                                             B36A 024
7785          64 IS=IS+1                                                               B36A 025
7786             IF(IS-NUMX)69,69 ,672                                                 B36A 026
7787          69 IO=2                                                                  B36A 027
7788             GO TO (61,65),IT                                                      B36A 028
7789          65 IS=IS-1                                                               B36A 029
7790          66 I=IS                                                                  B36A 030
7791             G=(((P(I+1)-P(I))/(X(I+1)-X(I)))-EM(I))/(X(I+1)-X(I))                 B36A 031
7792             F=(((EM(I+1)-EM(I))/(X(I+1)-X(I)))-2.*G)/(X(I+1)-X(I))                B36A 032
7793             H=(F*(XA-X(I+1))+G)*(XA-X(I))                                         B36A 033
7794             DPDI=(H+H+EM(I)+F*(XA-X(I)))*(XA-X(I)))                               B36A 034
7795          67 PR=(H+EM(I))*(XA-X(I))+P(I)                                           B36A 035
7796         601 CONTINUE                                                              B36A 036
7797             PRM(J)=PR                                                             B36A 037
7798         600 CONTINUE                                                              B36A 038
7799          60 CONTINUE                                                              B36A 039
7800           4 RETURN                                                                B36A 040
7801             END                                                                   B36A 041
7802      CB37A                                                                        B37A 001
7803             SUBROUTINE LCOUNT (J,LCT,NPG,R)                                       B37A 002
7804             COMMON/LOOCOM/KOUT,IEX,DEN,VR,IMI(23),ILO(23),IR(23)                  B37A 003
7805             I=J                                                                   B37A 004
7806             DIMENSION R(2)                                                        B37A 005
7807          551 FORMAT(1H112X61HAEROTHERM COUPLED ABLATION BOUNDARY LAYER ENVIRONM
7808            1ENT PROGRAM/73X4HPAGEI3/68X2A6)
7809             IF(I) 2,2,3                                                          B37A 008
7810           2 I=-I                                                                 B37A 009
7811             GO TO 4                                                              B37A 010
7812           3 LCT=LCT-I                                                            B37A 011
7813             IF (LCT) 4,5,5                                                       B37A 012
7814           4 NPG=NPG+1                                                            B37A 013
7815             LCT=55-I                                                             B37A 014
7816             WRITE (KOUT,551) NPG,R                                               B37A 015
7817           5 RETURN                                                               B37A 016
7818             END                                                                  B37A 017
7819      CB38A                                                                        B38A 001
7820             SUBROUTINE SBCPKG                                                    B38A 002
7821             COMMON/CAMCOM/TLMC(20,10,2),TMG(20),TTS(20,10,2),TCHEM(20,10,2),     B38A 003
7822            1NLO(20),NHI(20),KHI(20),JCMA,IMG,IMC,MMG,                            B38A 004
7823            2TCH(2),TPR(2),TRAD(2),IAB                                            B38A 005
7824            3,TT2(20,2),TMZ(20,2),TT1(30),TMG(30),DM12(2),TA(39),DELMG,I1,I2,CM   B38A 006
7825            4,CMD,BPRMG,KCM(10)                                                   B38A 007
7826             EQUIVALENCE (NCLASS,JCMA)                                            B38A 008
7827             COMMON/LOOCOM/KOUT,IEX,DEN,VR,IMI(23),ILO(23),IR(23)                 B38A 009
7828             COMMON/CMACOM/TEP(20,2), TCP(20, 2),TKP(20, 2)                       B38A 010
7829            3,RHO(2),MATL(38),DEL(39),SO(20),M(38),RC(38),RA(38),RECORD(36),      B38A 011
7830            4AREA(38),EMA(38),RAV(38),                                            B38A 012
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      5ROA(152),ROB(152),ROC(152),                                                    B38A 013
      6    TPI(30),VFZ,CMH,NPR,                                                       B38A 014
      7LCT,NPG,II,NBM,NUMN,NL,       DELM,RFT,RHORA,RHORB,RHORC,TRA                  B38A 015
      8CA,TRACB,TRACC,RHOOA,RHOOB,RHOOC,EA,EB,EC,BA,BB,BC,PSIA,PSIB,PSIC,             B38A 016
      9TRACM,PET,PETE,RSV,ETA,DTPR3,DTPR2,DTPRT,TPR3,TPR2,THZRO,THFIN,WT             B38A 017
       COMMON/CMACOM/EPSW,TRES,                                                       B38A 018
      1THWT,GAMA,OMG,NO,FJFH,FJFS,JF,JFHP,JFH,INPUT,     DTHIN,BRP,HCONV,            B38A 019
      2INCH,DTHB,NN,NI,NOI,CHCRI,PYCRI,NCON,    NR,TX(30),F1(30),F2(30)              B38A 020
       COMMON/SBCP/BF,CMMA,CMMI,DERR,DMIV,EMIV,ERFX,ERRC,ERR,ERRS,I3,I4,             B38A 021
      1VRM,VRP, IPR,IRA,IRB,IRC,IRD,ITL,PHI,QQ,TABC,TEMP,TSMA,TSMI,TSSQ             B38A 022
       COMMON/SBCP/ TNXT,   DNCP(3),CPE(3),TO(28),VITER(51),EITER(51)                B38A 023
       COMMON/SBCP/ Y2(16),D2(16),Y3(8),D3(8),Y1(2),D1(2)                            B38A 024
       COMMON/SBCP/ CPC( 50),CPV( 50),CP( 50),HP ( 50),HC( 50),CN( 50),              B38A 025
      1RAT( 50),ROT( 50),RO( 50),X( 50),RON( 50),DMDG( 50),RR ( 50),                B38A 026
      2CNC( 50),A( 50),B( 50),C( 50),D( 50),EMO( 50),CMO( 50)                       B38A 027
       COMMON/SBCP/BR,   CHZ,    CMOL,    DEDT,DEDTT,DSDTB,DTH,GSMS,HW,            B38A 028
      1HE,    ITS,PRES,QCHEM,QCHEMT,QCOND,QCONDT,QCONV,QCONVT,QRA,QRP,              B38A 029
      2QRPT,RAD,RADT,RSU,SIG,   TSAVE,VF,XP1,ASU                                    B38A 030
       COMMON/MISC/      BPRM,CMT,COLD,CP1,CPGAS,CPNL,CZ,DCDT,DECOM,                B38A 031
      1DECOMT,DELCR,DELR,DENOLD,DIDT,DNS,DPDT,DRLCP,DRLC,DRLP,DRL,DROAC,            B38A 032
      2DROAT,DROBC,DROBT,DROCC,DROCT,DRODTD,DSDT,DSI,DS,DSS,DTA,DTHC,DTHS           B38A 033
      3,DTS,DVB,DZ,EGO,EZ,FACT1,FACT2,FA,FB,FC,FJF,FK,FZ,GSEGR,GSM,GSMT,            B38A 034
      4GZ,H1,HAPHB,HBAR,HGAS,HRES,IE,IMA,I,IS,ISV,ITER,J1,J,KK,K,KT,L,              B38A 035
      5NDR,NLI,NLM,N,NZ,O,PGPU,PGPUT,POLD,POW,QLOSS,QLOSST,RD,RO1,ROOZ,SA           B38A 036
      6,SOEGR,TAS,TB,TERM1,TERM2,TERM3,THDS,TH,THPRT,TN,TOP1,TOP2,TOP3,T,           B38A 037
      7TT,VOL,X1                                                                    B38A 038
       EQUIVALENCE (DH1,DH12(1)),(DH2,DH12(2)),(TS,TA)                              B38A 039
       DATA VOID/4HVOID/                                                            B38A 040
  529 FORMAT(17H  ITERATION STOP  )                                                 B38A 041
  582 FORMAT(1P12E10.3)                                                             B38A 042
      IF(JCMA-2) 771,771,770                                                        B38A 043
  770 IF(JCMA-4) 2513,744,753                                                       B38A 044
  771 CONTINUE                                                                      B38A 045
      XP1=X(1)                                                                      B38A 046
      VF=VFZ
      ITL=10                                                                        B38A 047
      ITS=1                                                                         B38A 048
      VRP=(TH-TPR(1))/(TPR(2)-TPR(1))                                               B38A 049
      TNXT=AMAX1(TPR(2),TPR(1))                                                     B38A 050
      CH = TCH(1)+VRP*(TCH(2)-TCH(1))                                               B38A 051
      QRA=TRAD(1)+VRP*(TRAD(2)-TRAD(1))                                             B38A 052
      CHZ=CH                                                                        B38A 053
      IPR=1                                                                         B38A 054
      ERFX=D(1)                                                                     B38A 055
      CALL LOOK(12,GSMS/CH,TMG,0,0,0,0,Y2,D2,0)                                     B38A 056
      IMG=IR(12)                                                                    B38A 057
      VRM=VR                                                                        B38A 058
 2510 ILO(14)=NLO(IMG)                                                              B38A 059
      IHI(14)=NHI(IMG)                                                              B38A 060
      ILO(15)=NLO(IMG+1)                                                            B38A 061
      IHI(15)=NHI(IMG+1)                                                            B38A 062
      I1=ILO(14)                                                                    B38A 063
      I2=ILO(15)                                                                    B38A 064
      L1=I1
      L2=I2
      ERRM=1.0
      IF(IHI(14)-ILO(14)) 420,420,729
  729 CONTINUE
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7889            IF(TCHEM(I2,IMG+1,1)-VOID) 730,731,730                                  B38A 065
7890         730 IF(TCHEM(I1,IMG,1)-VOID) 732,731,732                                   B38A 066
7891         732 IF(TCHEM(I2,IMG+1,2)-VOID) 733,731,733                                 B38A 067
7892         733 IF(TCHEM(I1,IMG,2)-VOID) 2513,731,2513                                 B38A 068
7893         731 JCHA=3                                                                 B38A 069
7894             RETURN                                                                 B38A 070
7895        2513 TABC=TTS(I1,IMG,1)+VRM*(TTS(I2,IMG+1,1)-TTS(I1,IMG,1))                 B38A 071
7896        2515 TABC=TABC+VRP*(TTS(I1,IMG,2)+VRM*(TTS(I2,IMG+1,2)-TTS(I1,IMG+1,2)))   B38A 072
7897           1-TABC)                                                                 B38A 073
7898        2503 IF(TSAVE-TABC+.0001) 420,420,421
7899           C     ---------- ABLATING SURFACE                                       B38A 075
7900         421 IF(IAB) 422,422,423                                                    B38A 076
7901         422 CHDL=TLMC(I1,IMG,1)-VRM*(TLMC(I1,IMG,1)-TLMC(I2,IMG+1,1))             B38A 077
7902             CHD=EXP(CHDL)*CH                                                       B38A 078
7903             IAB=1                                                                  B38A 079
7904         423 CALL LOOK(14,CHDL,TLMC(1,IMG,1),0,0,0,0,0,0,0)                         B38A 080
7905             IRA=IR(14)                                                             B38A 081
7906             I1=IRA                                                                 B38A 082
7907             CALL LOOK(15,CHDL,TLMC(1,IMG+1,1),0,0,0,0,0,0,0)                       B38A 083
7908             IRB=IR(15)                                                             B38A 084
7909             I2=IRB                                                                 B38A 085
7910             CALL COMP (TCHEM(I1,IMG,1),TCHEM(I2,IMG+1,1),VOID,IFLAG)
7911             IF(IFLAG-1) 740,741,740                                                B38A 087
7912         741 JCHA=4                                                                 B38A 088
7913             RETURN                                                                 B38A 089
7914         740 CONTINUE                                                               B38A 090
7915         744 CALL LOOK(14,CHDL,TLMC(1,IMG,1),TTS(1,IMG,1),TCHEM(1,IMG,1),0,0,       B38A 091
7916            1Y2(1),Y2(3),2)                                                         B38A 092
7917             CALL LOOK(15,CHDL,TLMC(1,IMG+1,1),TTS(1,IMG+1,1),TCHEM(1,IMG+1,1),     B38A 093
7918            10,0,Y2(5),Y2(7),2)                                                     B38A 094
7919             CALL LOOK(14,CHDL,TLMC(1,IMG,2),TTS(1,IMG,2),TCHEM(1,IMG,2),0,0,       B38A 095
7920            1Y2(9),Y2(11),2)                                                        B38A 096
7921             CALL LOOK(15,CHDL,TLMC(1,IMG+1,2),TTS(1,IMG+1,2),TCHEM(1,IMG+1,2),     B38A 097
7922            10,0,Y2(13),Y2(15),2)                                                   B38A 098
7923             IIX=IEX-2
7924             DO 4232 I=1,8                                                          B38A 099
7925        4232 Y2(I)=Y2(I)+VRP*(Y2(I+8)-Y2(I))                                        B38A 100
7926        4233 DO 426 I=1,4                                                          B38A 101
7927         426 Y2(I)=Y2(I)+ (Y2(I+4)-Y2(I))*VRM                                       B38A 102
7928             IF(Y2(1)) 4260,4260,4261                                               B38A 103
7929        4260 ITL=ITS                                                               B38A 104
7930             GO TO 4350                                                             B38A 105
7931        4261 CONTINUE                                                              B38A 106
7932             CALL LOOK(4,Y2(1),TT2(1,2),TEP(1,2),0,0,0,EMIV,DMIV,1)                 B38A 107
7933             IF(MATL(1)-2) 428,427,428                                              B38A 108
7934         428 CALL LOOK(3,Y2(1),TT2(1,1),TEP(1,1),0,0,0,Y3,D3,1)                     B38A 109
7935             EMIV=EMIV+XP1*(Y3(1)-EMIV)
7936             DMIV=DMIV+XP1*(D3(1)-DMIV)
7937         427 TSSQ=Y2(1)*Y2(1)                                                       B38A 112
7938             TS=Y2(1)                                                               B38A 113
7939             RAD=SIG*EMIV*TSSQ*TSSQ*VF                                              B38A 114
7940         436 ERR=CH*Y2(2)+EMIV*QRA-RAD-B(1)*TS+ERFX                                 B38A 115
7941             ERRR=AMAX1(ABS(CH*Y2(2)),ABS(EMIV*QRA),ABS(RAD),ABS(B(1)*TS),
7942            1  ABS(ERFX))
7943             DERR=CH*Y2(4)+((QRA-RAD/EMIV)*DMIV-4./TS*RAD-B(1))*Y2(3)               B38A 116
7944             IF(DERR) 4365,4365,4362
7945        4362 IF(IIX) 4365,4368,4365
7946        4368 ITL=ITS
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7947            GO TO 4356
7948       4365 CONTINUE
7949            ERRC=ERR/DERR                                                  B38A 117
7950            VITER(ITS)=CMDL                                                B38A 118
7951            EITER(ITS)=ERR                                                 B38A 119
7952            CMDL=CMDL-ERRC                                                 B38A 120
7953            CMMI=-1.E+30                                                   B38A 121
7954            CMMA=+1.E+30                                                   B38A 122
7955            IF(ILO(14)-IRA) 4361,4363,4363                                 B38A 123
7956       4361 IF(ILO(15)-IRB) 4270,4363,4363                                 B38A 124
7957       4270 CMMI=AMAX1(CMMI,TLMC(IRA,IMG,IPR)+TLMC(IRA-1,IMG,IPR),TLMC(IRB,IMG B38A 125
7958           1+1,IPR)+TLMC(IRB-1,IMG+1,IPR))/2.                             B38A 126
7959            CMDL=AMAX1(CMDL,CMMI)                                          B38A 127
7960       4363 IF(IHI(14)-IRA-1) 4369,4369,4364
7961       4364 IF(IHI(15)-IRB-1) 4369,4369,4275
7962       4369 IF(ITS-ITL) 4366,4366,4360
7963       4360 IF(ERRS) 420,4367,4367
7964       4275 CMMA=AMIN1(CMMA,TLMC(IRA+1,IMG,IPR)+TLMC(IRA+2,IMG,IPR),TLMC(IRB+1 B38A 130
7965           1,IMG+1,IPR)+TLMC(IRB+2,IMG+1,IPR))/2.                         B38A 131
7966            CMDL=AMIN1(CMDL,CMMA)                                          B38A 132
7967            IF(ITS-ITL-1) 4366,4351,4352                                   B38A 133
7968       4351 ERRS=ERR                                                       B38A 134
7969            CMDL=CMMA                                                      B38A 135
7970            GO TO 4270
7971       4352 IF(ERR*ERRS) 4354,4367,4353                                    B38A 137
7972       4353 CMDL=CMMA                                                      B38A 138
7973            GO TO 4270
7974       4354 ITL=55                                                         B38A 140
7975            IF(ERRC) 4355,4367,4367                                        B38A 141
7976       4355 CMDL=CMMI                                                      B38A 142
7977            GO TO 4270
7978       4366 IF(ITS-ITL) 4367,4356,436)                                     B38A 144
7979       4356 CMDL=AMIN1(TLMC(L1,IMG,IPR),TLMC(L2,IMG+1,IPR))
7980       4279 CMDL=AMIN1(CMDL,TLMC(L1,IMG,IPR+1),TLMC(L2,IMG+1,IPR+1))
7981       4270 ERR=1.E+20
7982       4367 CMD=EXP(CMDL)*CM                                               B38A 147
7983            IF(ITS-50) 440,440,998                                         B38A 148
7984        440 ITS=ITS+1                                                      B38A 149
7985            IF(ABS(ERR/ERRM)-.01) 4372,4372,423
7986       C    ----------  NON-ABLATING SURFACE                               B38A 151
7987        420 TS=TSAVE                                                       B38A 152
7988            IAB=0                                                          B38A 153
7989            CMD=0.0                                                        B38A 154
7990       4382 ILO(18)=1                                                      B38A 155
7991            IHI(18)=KHI(IMG)                                               B38A 156
7992            ILO(19)=1                                                      B38A 157
7993            IHI(19)=KHI(IMG+1)                                             B38A 158
7994        430 CONTINUE                                                       B38A 159
7995            CALL LOOK(18,TS,TTS(1,IMG,1),0,0,0,0,0,0,0)                    B38A 160
7996            CALL LOOK(19,TS,TTS(1,IMG+1,1),0,0,0,0,0,0,0)                  B38A 161
7997            IRA=IR(18)                                                     B38A 162
7998            I1=IRA                                                         B38A 163
7999            IRB=IR(19)                                                     B38A 164
8000            I2=IRB                                                         B38A 1
8001            CALL COMP (TCHEM(I1,IMG,1),TCHEM(I2,IMG+1,1),VOID,IFLAG)
8002            IF(IFLAG-1) 742,743,742                                        B38A 167
8003        743 JCMA=5                                                         B38A 168
8004            RETURN                                                         B38A 169
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      742 CONTINUE                                                          B38A 170
      753 CALL LOOK(18,TS,TTS(1,IMG  ,1),TCHEM(1,IMG  ,1),TLMC(1,IMG  ,1),
     1 0,0,Y2(1),Y2(3),2)
          CALL LOOK(18,TS,TTS(1,IMG+1,1),TCHEM(1,IMG+1,1),TLMC(1,IMG+1,1),
     1 0,0,Y2(5),Y2(7),2)
          CALL LOOK(18,TS,TTS(1,IMG  ,2),TCHEM(1,IMG  ,2),TLMC(1,IMG  ,2),
     1 0,0,Y2(9),Y2(11),2)
          CALL LOOK(18,TS,TTS(1,IMG+1,2),TCHEM(1,IMG+1,2),TLMC(1,IMG+1,2),
     1 0,0,Y2(13),Y2(15),2)
          DO 4321 I=1,8
     4321 Y2(I)=Y2(I)+VRM*(Y2(I+8)-Y2(I))
     4322 DO 4323 I=1,4
     4323 Y2(I)=Y2(I)+VRM*(Y2(I+4)-Y2(I))
      433 CALL LOOK (4,TS,TT2(1,2),TEP(1,2),0,0,0,EMIV,DMIV,1)              B38A 181
          IF(MATL(1)-2) 434,442,434                                         B38A 182
      434 CALL LOOK (3,TS,TT2(1,1),TEP(1,1),0,0,0,Y3,D3,1)                  B38A 183
          EMIV=EMIV+XP1*(Y3(1)-EMIV)
          DMIV=DMIV+XP1*(D3(1)-DMIV)
      442 TSSQ=TS*TS                                                        B38A 186
     4422 RAD=SIG*EMIV*TSSQ*TSSQ*VF                                         B38A 187
      439 ERR=CM*Y2(1)+EMIV*QRA-RAD-B(1)*TS+ERFX                            B38A 188
          ERRM=AMAX1(ABS(CM*Y2(1)),ABS(EMIV*QRA),ABS(RAD),ABS(B(1)*TS),
     1   ABS(ERFX))
          DERR=CM*Y2(3)+((QRA-RAD/EMIV)*DMIV-4./TS*RAD-B(1))
          ERRC=ERR/DERR                                                 B38A 190
          VITER(ITS)=TS                                                 B38A 191
          EITER(ITS)=ERR                                                B38A 192
          TS=TS-ERRC                                                    B38A 193
     4391 TSMI=-1.E+30                                                  B38A 194
          TSMA=+1.E+30                                                  B38A 195
          IF(ILO(18)-IRA) 4509,4501,4501                                B38A 196
     4508 IF(ILO(19)-IRB) 4503,4501,4501                                B38A 197
     4503 TSMI=AMAX1(TSMI,TTS(IRB,IMG+1,IPR)+TTS(IRB-1,IMG+1,IPR),      B38A 198
     1TTS(IRA,IMG,IPR)+TTS(IRA-1,IMG,IPR))/2.                           B38A 199
          TS=AMAX1(TS,TSMI)                                             B38A 200
     4501 IF(IHI(18)-IRA-1) 4507,4507,4508                              B38A 201
     4508 IF(IHI(19)-IRB-1) 4507,4507,4510                              B38A 202
     4510 TSMA=AMIN1(TSMA,TTS(IRB+1,IMG+1,IPR)+TTS(IRB+2,IMG+1,IPR),    B38A 203
     1TTS(IRA+1,IMG,IPR)+TTS(IRA+2,IMG,IPR))/2.                         B38A 204
          TS=AMIN1(TS,TSMA)                                             B38A 205
     4507 CONTINUE                                                      B38A 206
          IF(ITS-50) 441,441,998                                        B38A 207
      441 ITS=ITS+1                                                     B38A 208
          IF(ABS(ERR/ERRM)-.01) 4390,4390,430
      998 WRITE (KOUT,529)                                              B38A 210
          WRITE(KOUT,502)(VITER(I),EITER(I),I=1,51)                     B38A 211
          WRITE(KOUT,502) TM,DTM,VRM,ERFX,TABC,EMIV,DMIV,RAD,B(1),CM,PMI,   B38A 212
     1 D(1),ME,XP1,QRA,Y2(1),Y2(2),Y2(3),Y2(4)                          B38A 213
          TM=TMPIN                                                      B38A 214
          JCMA=0                                                        B38A 215
          RETURN                                                        B38A 216
C     ---------- POST ITERATION                                         B38A 217
     4390 CONTINUE                                                      B38A 218
          IF(IAB) 4371,4371,4372                                        B38A 219
     4371 CMO=EXP(Y2(2))*CM
          Y2(2)=Y2(1)
     4372 QCONV=CM*Y2(2)                                                B38A 221
          IF(XCM(6)) 4376,4375,4376
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8063      4376 WRITE(KOUT,582) (VITER(I),EITER(I),I=1,ITS)
8064           WRITE(KOUT,582) TH,DTH,VRM,ERFX,TABC,EMIV,DMIV,RAD,B(1),CH,PHI,
8065          1 D(1),HE,XP1,QRA,Y2,DERR,VRP
8066      4375 CONTINUE
8067           QCHEM=0.                                                    B38A 222
8068           DSDTB=CMD/RHO(2)                                            B38A 223
8069      1437 RO(1)=RON(1)                                                B38A 224
8070           BR=CH/CHZ                                                   B38A 225
8071           QRP=EMIV*QRA                                                B38A 226
8072           QCOND=-D(1)+B(1)*TA(1)                                      B38A 227
8073           QCONVT=QCONVT+QCONV*DTH/AREA(1)*ASU                         B38A 228
8074           QCHEMT=QCHEMT+QCHEM*DTH/AREA(1)*ASU                         B38A 229
8075           QCONDT=QCONDT+QCOND*DTH/AREA(1)*ASU                         B38A 230
8076           QRPT=QRPT+QRP*DTH/AREA(1)*ASU                               B38A 231
8077           RADT=RADT+RAD*DTH/AREA(1)*ASU                               B38A 232
8078      C                                                                B38A 233
8079           DEDT=RON(1)*CP(1)*(TS-TSAVE)*DEL(1)/DTH                     B38A 234
8080           DO 95 I=2,NL                                                B38A 235
8081           RO(I) = RON(I)                                              B38A 236
8082           TEMP =(D(I  )-A(I  )*TA(I-1))/B(I  )                        B38A 237
8083           DEDT=DEDT+RON(I)*CP(I)*(TEMP-TA(I))*DEL(I)*RR(I)/DTH        B38A 238
8084        95 TA(I)=TEMP                                                  B38A 239
8085           IF (NUMN-NBM) 97,96,96                                      B38A 240
8086        96 K=NL                                                        B38A 241
8087           TA(NBM-1) = TA(NL)                                          B38A 242
8088           DO 98 I = NBM,NUMN                                          B38A 243
8089           K = K+1                                                     B38A 244
8090        98 TA(I) = (D(K)-A(K)*TA(I-1))/B(K)                            B38A 245
8091        97 DEDTT=DEDTT+DEDT*DTH/AREA(1)*ASU                            B38A 246
8092           JCMA=1                                                      B38A 247
8093           RETURN                                                      B38A 248
8094           END                                                         B38A 249
8095      CC00A                                                            C00A 001
8096           DIMENSION FT(21)
8097           COMMON/CAMCOM/TLMC(20,10,2),TMG(20),TTS(20,10,2),TCHEM(20,10,2),  C00A 002
8098          1NLC(20),NHI(20),KHI(20),JCMA,IMG,IMC,NMG,                  C00A 003
8099          2TCH(2),TPR(2),TRAD(2),IAB                                  C00A 004
8100          3,TT2(20,2),THZ(20,2),TT1(30),THG(30),DH12(2),TA(39),DELHG,I1,I2,CHC00A 005
8101          4,CMD,BPRMG,KCM(10)                                         C00A 006
8102           COMMON/BLQCOM/  MOA( 71),  MOB( 71),NSPEC,FR( 71,15),W(3),LEF(10) C00A   7
8103          1,LEFS(10),PIEASE,LEFW(10)                                  C00A   8
8104           COMMON/FLXCOM/DELQW,DELJW( 8),DQNL(153),DJNL(153, 8),WALLQ  C00A   9
8105          1,WALLJ( 8),QW,VJKW( 9),TPWALL                              C00A  10
8106           COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8C00A  11
8107          1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HHUE,HFW,DLX2  C00A  12
8108          2,C3M(40),BETAM(40)                                         C00A  13
8109           COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NC00A  14
8110          1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) C00A  15
8111          2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) C00A  16
8112          3,KAUXO,JTIME,JSPEC,MD(3)                                   C00A  17
8113           COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40) C00A  18
8114          1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO,  C00A  19
8115          2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                     C00A  20
8116           COMMON/PRPCOM/PR(15),T(15),RHO(15),SC(15),CAPC(15),QR(15),H(15)   C00A  21
8117          1,CPBAR(15),VMW(15),PHIK(15, 8),DRHOH,DRHOK( 8),ZK( 8),DZKH( 8),  DC00A  22
8118          2MU3K( 8),DMU4K( 8),DTK( 8),DPHIKH( 8),DPRK( 8),DSCK( 8),DCAPCK( 8)C00A  23
8119          3,DHTILK( 8),DQRK( 8),DCPBK( 8),DCPTK( 8),DMU12K( 8),DZKK( 8, 8)   C00A  24
8120          4,DPHIKK( 8, 8),      DMU4H,DMU3H,DHTILH,VMU12,CT,CTR,CPTIL,HTIL   C00A  25
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      5,VMU3,DTH,DCAPCH,DPRH,DSCH,DQRH,DCPBH,DCPTH,DMU12H,VMU(15),  RHOP C00A  26
      6(15),PHIKP(15),HP,TP,ZKP( 8),VMU3P,VMU4P,HTILP,CRHO(14),GMR(15)   C00A  27
       COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                    C00A  28
       COMMON/HALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPW( 8,40, 1)         C00A  29
      1,RHOVW(40, 1),FLUXJ( 3,40, 1),IHW,ITW,IFW,ISPW,IRHOVW,IFLUXJ      C00A  30
       COMMON/EQTCOM/SIP,HIP
       DATA VOID/4HVOID/
       DATA SEG1/6HSEG1  /                                               C00A 0
       DATA SEG2/6HSEG2  /                                               C00A 02
       DATA SEG3/6HSEG3  /                                               C00A 025
       DATA SEG4/6HSEG4  /                                               C00A 026
 7234 FORMAT(10I1,3I5,35X,20I1)                                          C00A 027
C++N.B.++ALSO DEFINED IN INPOUT,INPUT,CRECT AND RERAY
      KIN=8
      KOUT=5
      READ(KIN,7234) KCM,ITEM,IS,NITEM,KR
      KR(12)=1
      KR(2)=2
      KR17=KR(17)
C     IF KCM(10) = 0, DO NOTHING
C     IF KCM(10) = 1, SAVE
C     IF KCM(10) = 2, RESTART -- NO SAVE
C     IF KCM(10) = 3, RESTART -- SAVE
      IF (KCM(10)) 90,90,93
90    CONTINUE
      GO TO 95
   93 REWIND 12
   95 REWIND 13
      REWIND 14
      B(1)=.5
      B(2)=.333333333                                                  C00A 031
      B(3)=.166666666                                                  C00A 032
      B(4)=.125                                                        C00A 033
      B(5)=.041666666                                                  C00A 034
      B(6)=.033333333                                                  C00A 035
      B(7)=.013888888                                                  C00A 036
      B(8)=.003968254                                                  C00A 037
      IF (KCM(10) - 2) 102,100,100                                     C00A 038
C     RESTART
  100 NBT=13
      DO 107 IRW=1,2
      LIM=((IS-IRW+2)/2-1)*NITEM+ITEM-MOD(IS-1+IRW,2)
      IF(LIM) 107,107,109
  109 DO 108 I=1,LIM
  108 READ(NBT) HSTEQV
  107 NBT=14
      LIM=((IS-1)*NITEM+ITEM-1)*2
      DO 103 I=1,LIM
  103 READ(12) DUMEQV
      CALL DUMCOM(101)
      CALL DM2COM(101)
      GO TO 147
  102 NS=1
      IT=1
  105 IS=0                                                             C00A 041
      MWE=-1                                                           C00A 042
      JCM4=1                                                           C00A 043
  110 IS=IS+1                                                          C00A 044
                                                                       C00A 045
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8179            IF (IS-NS) 115,115,105
8180          115 CONTINUE
8181        C     CALL LOAD(SEG3)                                          C00A 047
8182              CALL INPOUT                                              C00A 048
8183              ITEM=1                                                   C00A 049
8184          120 J=MOD(ITEM,2)+1                                          C00A 050
8185              DO 129 IMG=1,NMG                                         C00A 051
8186              LIMC=NHI(IMG)                                            C00A 052
8187              DO 129 IMC=1,LIMC                                        C00A 053
8188          129 TCHEM(IMC,IMG,J)=VOID                                    C00A 054
8189        C     CALL LOAD (SEG4)                                         C00A 055
8190        C     REWIND 10                                                C00A 056
8191              CALL SETUP                                               C00A 057
8192              TPR(J)=TIME(ITEM)                                        C00A 058
8193              TCH(J)=-1./C3M(IS)                                       C00A 059
8194              TRAD(J)=RADS(IS)
8195              IF(ITEM-1) 128,128,130                                   C00A 061
8196          128 TPR(1)=TIME(NITEM)                                       C00A 062
8197          130 CONTINUE
8198        C     CALL LOAD(SEG1)                                          C00A 063
8199              CALL CMA                                                 C00A 064
8200        C     CALL LOAD(SEG2)                                          C00A 065
8201              KR(11)=3+IAB                                             C00A 066
8202              LIM=8                                                    C00A 067
8203              IF(JCMA-3) 140,150,160                                   C00A 068
8204          140 IF(JCMA) 141,141,142                                     C00A 069
8205          141 WRITE(NBT)  KCM                                          C00A 070
8206              STOP                                                     C00A 071
8207          142 FLUXJ(1,IS,IT)=0.
8208              FLUXJ(2,IS,IT)=-BPRMG
8209              FLUXJ(3,IS,IT)=-CMD/CH
8210              TW(IS,IT)=TA(1)                                          C00A 075
8211              KR(11)=3
8212              CALL BLIMP                                               C00A 076
8213          145 IF (IABS(KCM(10)-2)-1) 147,146,147
8214          146 CALL DUMCOM(102)
8215              CALL DM2COM(102)
8216          147 ITEM = ITEM+1
8217              IF(JCMA-1) 110,110,120                                   C00A 078
8218          150 LIM=4                                                    C00A 079
8219              KR(11)=4                                                 C00A 080
8220          160 II=I1                                                    C00A 081
8221        C     REWIND 10                                                C00A 082
8222              J=MOD(ITEM,2)+1                                          C00A 083
8223              DO 280 K=1,LIM                                           C00A 084
8224              IF(TCHEM(II,IMG,J)-VOID) 209,170,209                     C00A 085
8225          170 FLUXJ(1,IS,IT)=0.
8226              FLUXJ(2,IS,IT)=-TMG(IMG)
8227              IF(JCMA-4) 180,180,190                                   C00A 088
8228          180 FLUXJ(3,IS,IT)=-EXP(TLMC(II,IMG,J))
8229              GO TO 200                                                C00A 090
8230          190 FLUXJ(3,IS,IT)=0.
8231              TW(IS,1)=TTS(II,IMG,J)                                   C00A 092
8232          200 CALL BLIMP                                               C00A 093
8233              CALL LOOK(2,T(1),TT1,THG,0,0,0,HGA,CT1,1)                C00A 094
8234              HGA=HGA+DELHG                                            C00A 095
8235              CALL LOOK(4,T(1),TT2(1,2),THZ(1,2),0,0,0,HCH,CT2,1)      C00A 096
8236              HCH=HCH+DH12(2)                                          C00A 097
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8237            IF(JCMA.GT.4) TLMC(II,IMG,J)=ALOG(AMAX1(-W(3),0.00001))
8238            TCHEM(II,IMG,J)=(W(2)+W(3))*HIP*1.8+HALLQ-W(2)*HGA-W(3)*HCH
8239            TTS(II,IMG,J)=T(1)                                                  C00A 099
8240          209 GO TO (210,220,260,250,210,230,260,250),K                         C00A 100
8241          210 ITEM=ITEM-1                                                       C00A 101
8242              GO TO 270                                                         C00A 102
8243          220 II=I2                                                             C00A 103
8244              GO TO 240                                                         C00A 104
8245          230 II=I2+1                                                           C00A 105
8246          240 IMG=IMG+1                                                         C00A 106
8247              GO TO 280                                                         C00A 107
8248          250 IMG=IMG-1                                                         C00A 108
8249              II=I1+1                                                           C00A 109
8250              GO TO 280                                                         C00A 110
8251          260 ITEM=ITEM+1                                                       C00A 111
8252          270 J=3-J                                                             C00A 112
8253          280 CONTINUE                                                          C00A 113
8254              GO TO 130                                                         C00A 114
8255              END                                                               C00A 115
8256     CC01B                                                                      C01B 001
8257              SUBROUTINE DM2COM(ICK)                                            C01B 002
8258              COMMON/CAMCOM/TLMC(20,10,2),TMG(20),TTS(20,10,2),TCHEM(20,10,2),  C01B 003
8259             1NLO(20),NHI(20),KHI(20),JCMA,IMG,IMC,NMG,                         C01B 004
8260             2TCH(2),TPR(2),TRAD(2),IAB                                         C01B 005
8261             3,TT2(20,2),THZ(20,2),TT1(30),THG(30),DH12(2),TA(39),DELHG,I1,I2,CHC01B 006
8262             4,CMD,BPRMG,KCM(10)                                                C01B 007
8263              EQUIVALENCE (NCLASS,JCMA)                                         C01B 008
8264              COMMON/LOOCOM/KOUT,IEX,DEN,VR,IHI(23),ILO(23),IR(23)              C01B 009
8265              COMMON/CMACOM/TEP(20,2), TCP(20, 2),TKP(20, 2)                    C01B 010
8266             3,RHO(2),MATL(38),DEL(39),SC(20),H(38),RC(38),RA(38),RECORD(36),   C01B 011
8267             4AREA(38),EMA(38),RAV(38),                                         C01B 012
8268             5ROA(152),ROB(152),ROC(152),                                       C01B 013
8269             6     TPI(30),VFZ,CMH,NPR,                                         C01B 014
8270             7LCT,NPG,II,NBM,NUMN,NL,       DELM,RFT,RHORA,RHORB,RHORC,TRA      C01B 015
8271             8CA,TRACB,TRACC,RHOOA,RHOOB,RHOOC,EA,EB,EC,BA,BB,BC,PSIA,PSIB,PSIC,C01B 016
8272             9TRACM,PET,PETE,RSV,ETA,DTPR3,DTPR2,DTPRT,TPR3,TPR2,THZRO,THFIN,WT C01B 017
8273              COMMON/CMACOM/EPSW,TRES,                                          C01B 018
8274             1TMWT,GAMA,OMG,NO,FJFH,FJFS,JF,JFHP,JFH,INPUT,      DTHIN,BRP,HCONV,C01B 019
8275             2INCH,DTHB,NN,NI,NOI,CHCRI,PYCRI,NCON,     NR,TX(30),F1(30),F2(30) C01B 020
8276              COMMON/SBCP/BF,CMMA,CMMI,DERR,DMIV,EMIV,ERFX,ERRC,ERR,ERRS,I3,I4, C01B 021
8277             1VRM,VRP, IPR,IRA,IRB,IRC,IRD,ITL,PHI,QQ,TASC,TEMP,TSMA,TSMI,TSSQ  C01B 022
8278              COMMON/SBCP/ TNXT,   DNCP(3),CPE(3),TO(20),VITER(51),EITER(51)     C01B 023
8279              COMMON/SBCP/ Y2(16),D2(16),Y3(8),D3(8),Y1(2),D1(2)                C01B 024
8280              COMMON/SBCP/ CPC( 50),CPV( 50),CP( 50),HP ( 50),HC( 50),CN( 50),  C01B 025
8281             1RAT( 50),ROT( 50),RO( 50),X( 50),RON( 50),DMDG( 50),RR ( 50),     C01B 026
8282             2CNC( 50),A( 50),B( 50),C( 50),D( 50),EMO( 50),CNO( 50)            C01B 027
8283              COMMON/SBCP/BR,   CHZ,    CHDL,    DEDT,DEDTT,DSDTB,DTH,GSMS,HH,  C01B 028
8284             1HE,    ITS,PRES,QCHEM,QCHEMT,QCOND,QCONDT,QCONV,QCONVT,QRA,QRP,   C01B 029
8285             2QRPT,RAD,RADT,RSU,SIG,   TSAVE,VF,XP1,ASU                         C01B 030
8286              COMMON/MISC/      BPRM,CMT,COLD,CP1,CPGAS,CPNL,CZ,DCDT,DECOM,     C01B 031
8287             1DECOMT,DELCR,DELR,DENOLD,DICT,DNS,DPDT,DRLCF,DRLC,DRLP,DRL,DROAC, C01B 032
8288             2DROAT,DROBC,DROBT,DROCC,DROCT,DRODTD,DSDT,DSI,DS,DSS,DTA,DTHC,DTHSC01B 033
8289             3,DTS,DVB,DZ,EGO,EZ,FACT1,FACT2,FA,FB,FC,FJF,FK,FZ,GSEGR,GSM,GSMT, C01B 034
8290             4GZ,H1,HAPHB,HBAR,HGAS,HRES,IE,IMIN,I,IS,ISV,ITER,J1,J,KK,K,KT,L,  C01B 035
8291             5NDR,NLI,NLM,N,NZ,O,PGPU,PGPUT,POLD,PON,QLOSS,QLOSST,RD,RO1,ROOZ,SAC01B 036
8292             6,SOEGR,TAS,TB,TERM1,TERM2,TERM3,THDS,TH,THPRT,TN,TOP1,TOP2,TOP3,T,C01B 037
8293             7TT,VOL,X1                                                         C01B 038
8294              EQUIVALENCE (DH1,DH12(1)),(DH2,DH12(2)),(TS,TA)                   C01B 039
```

```
      DIMENSION CAMEQV(1478),LOOEQV( 73),CMAEQV(1125),SBCEQV(1237),
     1          MISEQV(101)
      EQUIVALENCE (CAMEQV,TLMC),(LOOEQV,KOUT),(CMAEQV,TEP),
     1            (SBCEQV,BF),(MISEQV,BPRM)
      IF (ICK - 101) 40,10,20
   10 READ ( 12 ) CAMEQV, LOOEQV, CMAEQV, SBCEQV, MISEQV
      GO TO 40
   20 WRITE( 12 ) CAMEQV, LOOEQV, CMAEQV, SBCEQV, MISEQV
   40 RETURN
      END                                                                C01B 041
CC02A                                                                    C02A 001
      SUBROUTINE BLIMP                                                   C02A 002
      DIMENSION HIST1(605),HIST2(607),HIST3(511),VMAT(566),HIST4(600)    C02A 003
      COMMON/BLQCOM/  MOA( 71),  MOB( 71),NSPEC,FR( 71,15),W(3),LEF(10)  C02A   4
     1,LEFS(10),PIEASE,LEFW(10)                                          C02A   5
      COMMON/EDGCOM/              PE(40, 1),PTE(40, 1),SPE( 8,40, 1),DUES,C02A   6
     1UE(40),RHOE(40),VMUE(40),TE(40),UEDGE,DUEDGE,D2UEDG,VMWE,HE,C90    C02A   7
     2 ,DSIP(40),IDSIP,TTVC,TVCC(40)                                     C02A   8
      COMMON/FLPCOM/TXI(2),TUE(2),TRHOE(2),TTE(2),TVMUE(2),TMAT(566,2)   C02A   9
     2,THF(15,2),TLEFT(10,2),TPE(2),TRADS(2),TDSIP(2),KQT(2)             C02A  10
      COMMON/HISCOM/C1,C2,C3,C4,ALPHD,BETA,ZM(4,14),ZG(4,14),ZSP(4,14, 8C02A  11
     1 ),XI(40),HF(15,5),HG(15,3),HSP(15,3, 8),HALPH,HUE,HHUE,HFW,DLX2   C02A  12
     2,C3M(40),BETAM(40)                                                 C02A  13
      COMMON/INTCOM/ KR(20),KIN,KOUT,MAT1I,MAT2I,MAT1J,MAT2J,NETA,I,IS,NC02A  14
     1S,IT,NTIME,NSP,NSPM1,NAM,NLEQ,NNLEQ,NRNL, ITS,KAPPA,CBAR,CASE(15) C02A  15
     2,B(8),      MWE,NON,KQ(10),ITEM,NITEM,KR17,NBT,NBT2,IDENT,KR9(40) C02A  16
     3,KAUXO,JTIME,JSPEC,MD(3)                                           C02A  17
      COMMON/PRMCOM/TIME( 50),PRE(40),PTET( 50),GE( 50),S(40),ROKAP(40)  C02A  18
     1,RNOSE,VKAP,NDISC,IDISC(40),NSD(10),MSD(10),ITF( 50),IPRE,RADNO,   C02A  19
     2CONE,RADFL( 50),RADR(40),RADS(40),IRAD                             C02A  20
      COMMON/VARCOM/F(4,15),G(3,15),SP(3,15, 9),ALPH                     C02A  21
      COMMON/WALCOM/FW(40, 1),TW(40, 1),HW(40, 1),SPW( 8,40, 1)          C02A  22
     1,RHOVW(40, 1),FLUXJ( 3,40, 1),IHW,ITW,IFW,ISPW,IRHOVW,IFLUXJ       C02A  23
      EQUIVALENCE(HIST1,XI),(HIST2, PE),(HIST3,F),(VMAT,C1),(HIST4,FW)   C02A 008
    3 FORMAT(/1H17X4HTIMEE12.5,35H SECONDS - - - STREAMWISE DIMENSICNE12C02A 023
     1.5,11H FEET - - - 3A6)
      CALL DATE(9,MD)
      CALL TOD(18,MD)
      WRITE(KOUT,3) TIME(ITEM),S(IS),MD
  140 J=MOD(ITEM,2)+1                                                    C02A 027
      DO 142 I=1,NETA                                                    C02A 028
  142 HF(I,5)=THF(I,J)                                                   C02A 029
      XI(IS)=TXI(J)                                                      C02A 030
      RADS(IS)=TRADS(J)
      DSIP(IS)=TDSIP(J)
      UE(IS)=TUE(J)                                                      C02A 031
      RHOE(IS)=TRHOE(J)                                                  C02A 032
      TE(IS)=TTE(J)                                                      C02A 033
      VMUE(IS)=TVMUE(J)                                                  C02A 034
      KQ(10)=KQT(J)
      DO 141 I=1,566                                                     C02A 035
  141 VMAT(I)=TMAT(I,J)                                                  C02A 036
      PTE(IS,1)=PTET(ITEM)                                               C02A 037
      PE(IS,1)=TPE(J)                                                    C02A 038
      DUM1=(GE(ITEM)-G(1,1))/(G(1,NETA)-G(1,1))                          C02A 039
      DO 113 I=1,NETA                                                    C02A 040
      G(3,I)=G(3,I)*DUM1                                                 C02A 041
      G(2,I)=G(2,I)*DUM1                                                 C02A 042
```

```
8353      113 G(1,I)=G(1,1)+DUM1*(G(1,I)-G(1,1))                    C02A 043
8354          ITS=0                                                 C02A 044
8355          KR(17)=KR17                                           C02A 045
8356       43 CALL ITERAT                                           C02A 046
8357          CALL OUTPUT                                           C02A 047
8358          IF(NON) 43,40,41
8359       41 STOP 5050
8360       40 RETURN                                                C02A 049
8361          END                                                   C02A 050
```

SECTION IV

CHECK CASES

Two check cases were run on the AFWL CDC 6600 computer using the modified BLIMP code with the entropy layer swallowing option. Check Case I was a rocket sled boundary layer which simulates a reentry plasma. Edge conditions for this case have in the past been difficult to obtain using mass balancing techniques external to BLIMP. Check Case II was the boundary layer on a typical reentry vehicle.

Definition, input, and output of Case I and of Case II follow. The complete output is not included due to its large volume. Only the first and last points of the boundary layer edge and shock thermodynamic state output are presented. The boundary layer solutions for the stagnation point and for one station on the after body are presented for each case.

1. CHECK CASE 1 - SPHERE-CONE ON ROCKET SLED

   a. Vehicle Configuration

      1) Geometry: Sphere-cone

         a) Nose Radius: 1/2-inch

         b) Cone half angle: 9 degrees

         c) Length (streamwise): 1.9639 feet

      2) Heatshield:

         a) Location: Between streamwise distances of .10686 feet and 1.5520 feet.

         b) Material: Avcoat 8024 (epoxy urethane)-$C_{567}H_{950}O_{113}N_{35}$

         c) From 0 to .10686 feet (streamwise) and from 1.5520 to 1.9639 the cone is considered nonablating.

         d) Contamination: Heatshield contains 20 pct by weight $CsNO_3$.

   b. Wall Boundary Conditions

      1) Mass Ablation Rate: See Case I input cards.

      2) Wall Temperature: See Case I input cards.

c. Free Stream Properties

1) Altitude: 4,000 feet

2) Velocity: 8,000 feet/second

3) Density: .06792 lb/ft^3

4) Enthalpy: 120.435 Btu/lb (ref. to 0°K).
(static, -7.761 Btu/lb, ref. to 298°K)

5) Pressure: 0.86384 atm

6) Mach No.: 7.2661

d. Shock Data

1) Local Pressure Ratio: See Case I input cards

2) Stagnation Conditions (from inviscid flow solution):

a) Pressure: 59.114 atm

b) Enthalpy: 1270.5 Btu/lb (ref. to 298°K)

3) Freestream stream function position vs. shock angle: See Case I input cards

e. Input cards

```
1020302020300300 1  CHECK CASE 1 - 8000 FPS ROCKET SLED
blank card
 5
 1
 1.
30
0.          .004        .008        .012        .017        .027        .038        .045
.058705     .069        .080        .09         -.1065      -.10686     .19206      .27643
.36080      .44518      .61392      .78267      .95141      1.2045      1.400       -1.552
-1.5628     1.62345     1.6961      1.76775     1.83930     1.96390
15
0.          .002        .004        .007        .012        .02         .03         .05
.1          .2          .35         .5          1.0         1.6         2.5
13 .95
0.0         .04166667
-.04166667
.041154
blank card
                                                            .33916
52.114
1270.5
 .
0.44        11.223      0.018       0.0         0.0         300.
1610.
  6
  1HYDROGEN     1.008                       755.003
  6 CARBON      12.011                      450.618
  7NITROGEN     14.008      -.765           38.077
  8 OXYGEN      16.000      -.235           120.588
 55 CESIUM      132.91                      10.261
 99ELECTRON     0.00055
  1 55                                      JANAF 06/68        AFWL - JEF  CS
 183100+5 140420+5 338117+1 953465-3 363865+6 536529+2   500  30001     OCS
 133100+5 140420+5-177453+2 621867-2 483422+8 536529+2  3000  60001     OCS
  2  1  0  0  0  0  0                      JANAF 03/61                    H2
       -  212100+5 711963+1 621050-3-712694+6 484650+2  500. 3000.1   0.H2
       -  212100+5 691704+1 599854-3 265106+7 484650+2 3000. 5000.1   0.H2
  1  6  1  8  0  0  0  0  0                JANAF 03/61                    CO
-264170+5 223570+5 966040+1 117021-3-398211+6 653700+2  500. 3000.1   0.CO
-264170+5 223570+5 119406+2-424139-3-131563+3 653700+2 3000. 5000.1   0.CO
  1  6  2  8  0  0  0  0  0  0             JANAF 03/61                    CO2
-940540+5 365350+5 144959+2 210386-3-182392+7 798480+2  500. 3000.1   0.CO2
-940540+5 365350+5 156481+2-381561-4-602768+7 798480+2 3000. 5000.1   0.CO2
  2  7  0  0  0  0  0                      ASRETT LOW TEMP                N2
      0+0 281718+5 5.2936  .00308              66552 +2      500.  1    -0N2
      0+0 221640+5 799097+1 319649-3-314095+6 637650+2      3000. 1     N2
  1 99                                      JANAF   05/65    AFWL - JEF   E-
 0         134230+5 496800+1 215333-5 262840-6 164590+2   500  30001     E-
 0         134230+5 496800+1-232369-6-986224-6 164590+2  3000  50001     E-
  1  6  0  0  0  0  0                      JANAF 03/61                    C
 170896+6 125500+5 444432+1 228125-3 409330+6 492870+2  500. 3000.1   0.C
 170896+6 125500+5 412212+1 261908-3 262086+7 492870+2 3000. 5000.1   0.C
  1  1  0  0  0  0  0                      JANAF 12/60                    H
 521020+5 134230+5 480223+1 555160-4 173095+6 388620+2  500. 3000.1   0.H
 521020+5 134230+5 309752+1 315025-3 939744+7 388620+2 3000. 5000.1   0.H
  1  8  0  0  0  0  0                      JANAF 06/62                    O
```

```
 595500+5 135220+5 497208+1 380768-5 154749+5 500960+2  500. 3000.1   0.O
 595500+5 135220+5 657489+1-224268-3-891782+7 500960+2 3000. 5000.1   0.O
  1  7  0  0  0  0  0                    JANAF 03/61                    N
 112965+6 134370+5 496044+1 383516-4 958460+5 480900+2  500. 3000.1   0.N
 112965+6 134370+5 420057+1 240844-3-417273+6 480900+2 3000. 5000.1   0.N
  3  6  0  0  0  0  0     *              JANAF 12/60                    C3
 189670+6 366220+5 144441+2 622536-4-168227+7 798410+2  500. 3000.1   0.C3
 189670+6 366220+5 144782+2 702232-4-646077+6 798410+2 3000. 5000.1   0.C3
  4  1  1  6  0  0  0  0  0  0  *       JANAF 03/61                    CH4
-178950+5 530790+5 230948+2 677896-3-755061+7 825970+2  500. 3000.1   0.CH4
-178950+5 530790+5 236053+2 374323-3-368234+7 825970+2 3000. 5000.1   0.CH4
  1  6  1  7  0  0  0  0  0  0  C       JANAF 12/62                    CN
 109000+6 232490+5 655906+1 115326-2 479517+6 669760+2  500. 3000.1   0.CN
 109000+6 232490+5 988013+1 313855-3-649453+7 669760+2 3000. 5000.1   0.CN
  1  1  1  6  0  0  0  0  0  0           JANAF 03/61                    CH
 142006+6 221300+5 826079+1 302211-3-100184+7 616120+2  500. 3000.1   0.CH
 142006+6 221300+5 707091+1 463281-3 552860+7 616120+2 3000. 5000.1   0.CH
  1  1  1  6  1  7  0  0  0  0  0  0 0JANAF 03/61                      CHN
 312000+5 355930+5 137023+2 552243-3-228955+7 758620+2  500. 3000.1   0.CHN
 312000+5 355930+5 176895+2-295052-3-183671+8 758620+2 3000. 5000.1   0.CHN
  1  1  1  6  1  8  0  0  0  0  0  0 0JANAF 03/61                      CHO
-290000+4 323670+5 129033+2 300638-3-201721+7 789830+2  500. 3000.1   0.CHO
-290000+4 323670+5 130028+2 633312-3 121615+8 789830+2 3000. 5000.1   0.CHO
  2  6  1  0  0  0  0                    JANAF 9/61                     C2
 193990+6 246990+5 776612+1 696081-3 185649+6 685519+2  500. 3000.1   0.C2
 198990+6 246990+5 104162+2 566841-4-640205+7 685519+2 3000. 5000.1   0.C2
  2  1  2  6  0  0  0  0  0  0           JANAF 03/61                    C2H2
 541990+5 482570+5 189960+2 769044-3-409039+7 849690+2  500. 3000.1   0.C2H2
 541990+5 482570+5 209952+2 389062-3-645297+7 849690+2 3000. 5000.1   0.C2H2
  2 55                                 JANAF 06/68       AFWL-JEF     CS2
 253999+5 273409+5 794214+1 122378-2 220339+6 903289+2   500  30001    OCS2
 253999+5 273409+5 110999+2 827707-3-174425+  903289+2  3000  60001    OCS2
  1  1  1  9  1 55                       ATLANTIC RESEARCH  AFWL-NV     CSOH
-550999+5 369869+5 129799+2 539249-3-222031+6 913640+2   500  30001    OCSOH
-550999+5 369869+5 149099+2 477010-4-341184+7 913640+2  3000  60001    OCSOH
  1  1  1  7  2  8  0  0  0  0  0  0 0JANAF  06/63      AFWL - WRS   HNO2 CIS
-183400+5 468800+5 169879+2 915578-3-107976+7 962540+2   500  30001    HNO2 CIS
-183400+5 468800+5 183435+2 221282-3 386246+7 962540+2  3000  50001    HNO2 CIS
  1  1  1  7  2  8  0  0  0  0  0  0 0JANAF  06/63      AFWL - WRS   HNO2 TRA
-188400+5 468840+5 165223+2 926502-3-102717+7 962980+2   500  30001    HNO2 TRA
-188400+5 468840+5 173227+2 224085-3 378011+7 962980+2  3000  50001    HNO2 TRA
  1  1  1  9  0  0  0  0  0  0           JANAF 12/60                    HO
 933000+4 214340+5 772103+1 304286-3-973561+6 613820+2  500. 3000.1   0.HO
 933000+4 214340+5 965144+1-443528-4-586115+7 613820+2 3000. 5000.1   0.HO
  2  1  1  8  0  0  0  0  0  0           JANAF 03/61                    H2O
-577990+5 302010+5 112254+2 811397-3-260800+7 684210+2  500. 3000.1   0.H2O
-577990+5 302010+5 157278+2-191543-3-173599+8 684210+2 3000. 5000.1   0.H2O
  1  7  1  8  0  0  0  0  0  0           JANAF 06/63                    NO
 215800+5 227000+5 877603+1 999031-4-789656+6 688490+2  500. 3000.1   0.NO
 215800+5 227000+5 916260+1 657885-5-212519+7 688490+2 3000. 5000.1   0.NO
  2  8  0  0  0  0  0                    ABBETT LOW TEMP                02
      0+0 146500+5 9.1087  -.00167          63228 +2       500.  1    -002
      0+0 224459+5 809690+1 407028-3-242282+6 679729 2     3000.  1    -002
  1 55 -1 00                           JANAF 06/68       AFWL-JEF     CS+1
 108000+6 124229+5 426709+1 000000-9 215212-6 520350+2   500  30001    OCS+1
 108000+6 124229+5 426990+1 000000-9-623513-4 520350+2  3000  60001    OCS+1
```

```
  1  6 -1 99  0  0  0  0  0  0  0          CONVAIR ZPH-122 12/61          C+
+429925+6+150120+5+489657+1+190700-4+340000+5+484232+22000. 10000.1      C+
+429925+6+150120+5+489657+1+190700-4+340000+5+484232+22000. 10000.1      C+
  1  1 -1 99                               AFWL TDR 64-44 NOK  TO 298 JEFH+1
 367161+6 174226+5 496703+1-596238-5-304069-6 374820+2   500  30001      H+1
 367161+6 174226+5 496703+1-267224-5-113416-4 374820+2  3000  50001      H+1
  1  7 -1 99  0  0  0  0  0  0  *          CONVAIR ZPH-122 12/61          N+
+446641+6+151310+5+501751+1+617100-4-184100+7+496847+22000. 10000.1      N+
+446641+6+151310+5+501751+1+617100-4-184100+7+496847+22000. 10000.1      N+
  2  8  1 99  0  0  0  0  0                CONVAIR ZPH-122 12/61          O2-
-205250+5+267570+5+111480+2-656700-4-779100+7+699149+22000. 10000.1      O2-
-205250+5+267570+5+111480+2-656700-4-779100+7+699149+22000. 10000.1      O2-
  1  6  1  8 -1 99  0  0  0  0  0  0  0  OCONVAIR ZPH-122 12/61          CO+
+294293+6+243330+5+899619+1+378000-4-150900+7+666595+22000. 10000.1      CO+
+294293+6+243330+5+899619+1+378000-4-150900+7+666595+22000. 10000.1      CO+
  1  7  1  8 -1 99  0  0  0  0  0  0  0  OCONVAIR ZPH-122 12/61          NO+
+232919+6+241070+5+910216+1+277400-4-316600+7+654379+22000. 10000.1      NO+
+232919+6+241070+5+910216+1+277400-4-316600+7+654379+22000. 10000.1      NO+
  1  8 -1 99  0  0  0  0  0  0             +ONVAIR ZPH-122 12/61          O+
+371999+6+149290+5+336271+1+306710-3+590200+7+484849+22000. 10000.1      O+
+371999+6+149290+5+336271+1+306710-3+590200+7+434849+22000. 10000.1      O+
```

blank card

```
20 8000.   0.06792    -7.761     0.86384
5 0.       .020022    .040044    .059622    .080267    .10229     .12122     .14190
.17047     .20533     .25116     .29886     .39531     .50475     .59883     .70431
.80563     1.0149     1.4094     1.8017
3 0.       .3554      .6859      .9353      1.0980     1.1971     1.2488     1.2862
1.3196     1.3451     1.3587     1.3692     1.3809     1.3737     1.3631     1.3587
1.3566     1.3545     1.3537     1.3535
```

blank card

```
1.0        .9893      .95708     .90543     .81812     .59897     .35254     .22746
.075363    .071960    .067962    .064438    .059230    .059126    .043652    .037947
.035854    .035302    .036110    .037829    .039577    .041609    .042712    .043350
.043353    .043601    .043828    .044029    .044211    .044487
```

six blank cards

```
5400.      5200.      5000.      4700.      4400.      4000.      3700.      3200.
2800.      2600.      2400.      2000.      1600.      1522.      1513.      1506.
1501.      1499.      1498.      1502.      1505.      1507.      1510.      1510.
1500.      1500.      1500.      1500.      1500.      1500.
```

nine blank cards

```
0.         0.         0.         0.         0.         0.         0.         0.
0.         0.         0.         0.         0.         .65        .585       .55
.52        .49        .482       .495       .518       .539       .549       .55
```

```
0.        0.        0.        0.        0.        0.
blank card
(end of file card)
```

f. Computer output

The first and last points of the boundary layer edge and shock thermodynamic state output are presented. The boundary layer solutions for the stagnation point and for one station on the afterbody are also included.

BOUNDARY LAYER INTEGRAL MATRIX PROGRAM (BLIMP)

AEROTHERM CORPORATION, PALO ALTO, CALIF (RMK, EPB)

CASE CHECK CASE 1 - 8000 FPS ROCKET SLED

CONTROL NUMBERS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	1	0	2	0	3	0	2	0	2	0	0	2	0	0	0	0	-0	1	0	-0

PUNCH CONTROL
IDENT JSPEC
-0

U/UE TO NORM. ETA	NODAL PT. AT WHICH ETA NORM.	ETA VALUES
9.500E-01	13	0.E+00 2.000E-03 4.000E-03 7.000E-03 1.200E-02 2.000E-02 3.000E-02 5.000E-02 1.000E-01 2.000E-01 3.500E-01 5.000E-01 1.000E+00 1.600E+00 2.500E+00

NOSE RADIUS,FT 4.16667E-02 CONE HALF ANGLE 9.00000E+00 DEGREES

CASE	1.00000E+00
TOTAL ENTHALPY,BTU/LB	1.27050E+03
TOTAL PRESSURE,ATM	5.91140E+01
INCIDENT RAD FLUX,B/SF2	0.E+00

MIXING LENGTH CONSTANT = 4.4000E-01
SUBLAYER CONSTANT, YA+ = 1.1823E+01
CLAUSER NUMBER = 1.8000E-02
TURBULENT SCHMIDT NUMBER= 9.0000E-01
TURBULENT PRANDTL NUMBER= 9.0000E-01
TRANSITION MOM.THICK.RE = 3.0000E+02

CASE 1 -

RELATIVE ELEMENTAL COMPOSITIONS, ATOMIC WTS/UNIT MASS

AT.NO.	ELEMENT	ATOMIC WT	EDGE GAS	PYRO.GAS 1	CHAR 1	PYRO.GAS 2	CHAR 2	PYRO.GAS 3	CHAR 3
1	HYDROGEN	1.00800	0.0000000	-0.0000000	00.0755003	-0.0000000	-0.0000000	-0.0000000	-0.0000000
6	CARBON	12.01100	0.0000000	-0.0000000	00.0450618	-0.0000000	-0.0000000	-0.0000000	-0.0000000
7	NITROGEN	14.00800	00.0546117	-0.0000000	00.0038077	-0.0000000	-0.0000000	-0.0000000	-0.0000000
8	OXYGEN	16.00000	00.1146875	-0.0000000	00.0120588	-0.0000000	-0.0000000	-0.0000000	-0.0000000
55	CESIUM	132.91300	0.0000000	-0.0000000	00.0010261	-0.0000000	-0.0000000	-0.0000000	-0.0000000
99	ELECTRON	00.00055	0.0000000	-0.0000000	0.0000000	-0.0000000	-0.0000000	-0.0000000	-0.0000000

THERMODYNAMIC PROPERTY CURVE-FIT DATA (SEE MANUAL FOR FORMAT)

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1. 55-0. -0-0. -0-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 06/68       AFWL - JEF  CS
 0.18320E+05 0.14043E+05 0.38812E+01 0.95347E-03 0.36387E+06 0.53653E+02  500.0000  3000.0000 1
 0.18320E+05 0.14043E+05-0.17745E+02 0.62187E-02 0.48342E+08 0.53653E+02 3000.0000  6000.0000 1
2.  1 0.  0 0.  0 0.  0 0.  0 0.  0 0.  0JANAF 03/61                      H2
 0.E+00      0.21210E+05 0.71196E+01 0.62195E-03-0.71259E+06 0.48465E+02  500.0000  3000.0000 1
 0.E+00      0.21210E+05 0.68179E+01 0.58985E-03 0.26511E+07 0.48465E+02 3000.0000  5000.0000 1
1.  6 1.  8 0.  0 0.  0 0.  0 0.  0JANAF 03/61                      CO
-0.26417E+05 0.22357E+05 0.86504E+01 0.11702E-03-0.89821E+06 0.65370E+02  500.0000  3000.0000 1
-0.26417E+05 0.22357E+05 0.11550E+02-0.42414E-03-0.13156E+08 0.65370E+02 3000.0000  5000.0000 1
1.  6 2.  8 0.  0 0.  0 0.  0 0.  0 0.  0JANAF 03/61                      CO2
-0.94054E+05 0.36535E+05 0.14456E+02 0.21039E-03-0.18239E+07 0.79848E+02  500.0000  3000.0000 1
-0.94054E+05 0.36535E+05 0.15645E+02-0.38156E-04-0.60277E+07 0.79848E+02 3000.0000  5000.0000 1
2.  7 0.  0 0.  0 0.  0 0.  0 0.  0 0.  0ABBETT LOW TEMP                  N2
 0.E+00      0.28172E+05 0.52936E+01 0.30800E-02-0.E+00       0.66552E+02   -0.0000   500.0000 1
 0.E+00      0.22165E+05 0.79310E+01 0.31965E-03-0.31429E+06 0.63765E+02   -0.0000  3000.0000 1
1. 99-0. -0-0. -0-0. -0-0. -1-0. -0-0. -0JANAF   05/65    AFWL - JEF   E-
 0.E+00      0.13423E+05 0.49680E+01 0.21533E-05 0.26284E-06 0.16459E+02  500.0000  3000.0000 1
 0.E+00      0.13423E+05 0.49680E+01-0.23237E-06-0.98622E-06 0.16459E+02 3000.0000  5000.0000 1
1.  6 0.  0 0.  0 0.  0 0.  0 0.  0 0.  0JANAF 03/61                      C
 0.17089E+06 0.13550E+05 0.44443E+01 0.22813E-03 0.40983E+06 0.49287E+02  500.0000  3000.0000 1
 0.17089E+06 0.13550E+05 0.41221E+01 0.26191E-03 0.26289E+07 0.49287E+02 3000.0000  5000.0000 1
1.  1 0.  0 0.  0 0.  0 0.  0 0.  0 0.  0JANAF 12/60                      H
 0.52102E+05 0.13423E+05 0.48022E+01 0.55547E-04 0.17310E+06 0.38862E+02  500.0000  3000.0000 1
 0.52102E+05 0.13423E+05 0.38875E+01 0.31503E-03 0.92974E+07 0.38862E+02 3000.0000  5000.0000 1
1.  8 0.  0 0.  0 0.  0 0.  0 0.  0 0.  0JANAF 06/62                      O
 0.59559E+05 0.13522E+05 0.49723E+01 0.38077E-05 0.16475E+05 0.50096E+02  500.0000  3000.0000 1
 0.59559E+05 0.13522E+05 0.65749E+01-0.22427E-03-0.89178E+07 0.50096E+02 3000.0000  5000.0000 1
1.  7 0.  0 0.  0 0.  0 0.  0 0.  0 0.  0JANAF 03/61                      N
 0.11297E+06 0.13437E+05 0.48694E+01 0.38352E-04 0.95846E+05 0.48090E+02  500.0000  3000.0000 1
 0.11297E+06 0.13437E+05 0.42896E+01 0.24084E-03-0.41727E+06 0.48090E+02 3000.0000  5000.0000 1
3.  6 0.  0 0.  0 0.  0 0.  0 0.  0 0.  0JANAF 12/60                      C3
 0.18967E+06 0.36622E+05 0.14644E+02 0.62254E-04-0.16823E+07 0.79841E+02  500.0000  3000.0000 1
 0.18967E+06 0.36622E+05 0.14478E+02 0.79223E-04-0.64508E+06 0.79841E+02 3000.0000  5000.0000 1
4.  1 1.  6 0.  0 0.  0 0.  0 0.  0JANAF 03/61                      CH4
-0.17895E+05 0.53079E+05 0.23195E+02 0.67790E-03-0.75506E+07 0.82597E+02  500.0000  3000.0000 1
-0.17895E+05 0.53079E+05 0.23605E+02 0.37432E-03-0.36823E+07 0.82597E+02 3000.0000  5000.0000 1
1.  6 1.  7 0.  0 0.  0 0.  0 0.  0 0.  0JANAF 12/62                      CN
 0.10900E+06 0.23249E+05 0.65591E+01 0.11533E-02 0.47952E+06 0.66976E+02  500.0000  3000.0000 1
 0.10900E+06 0.23249E+05 0.98801E+01 0.31386E-03-0.64945E+07 0.66976E+02 3000.0000  5000.0000 1
1.  1 1.  6 0.  0 0.  0 0.  0 0.  0 0.  0JANAF 03/61                      CH
 0.14201E+06 0.22130E+05 0.92608E+01 0.30221E-03-0.10018E+07 0.61612E+02  500.0000  3000.0000 1
 0.14201E+06 0.22130E+05 0.70709E+01 0.46328E-03 0.55286E+07 0.61612E+02 3000.0000  5000.0000 1
1.  1 1.  6 1.  7 0.  0 0.  0 0.  0 0.  0JANAF 03/61                      CHN
 0.31209E+05 0.35593E+05 0.13702E+02 0.55224E-03-0.22895E+07 0.75862E+02  500.0000  3000.0000 1
 0.31209E+05 0.35593E+05 0.17389E+02-0.29505E-03-0.18367E+08 0.75862E+02 3000.0000  5000.0000 1
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1.  1 1.  6 1.  8 0.  0 0.  0 0.  0 0.  0JANAF 03/61                    CHO
-0.29000E+04  0.32367E+05 0.12533E+02 0.30064E-03-0.20172E+07 0.78983E+02  500.0000  3000.0000 1
-0.29000E+04  0.32367E+05 0.10303E+02 0.63331E-03 0.12161E+06 0.78983E+02 3000.0000  5000.0000 1
2.  6 0.  0 0.  0 0.  0 0.  0 0.  0 0.  0JANAF 9/61                     C2
 0.19900E+06  0.24699E+05 0.77661E+01 0.69608E-03 0.19565E+06 0.68552E+02  500.0000  3000.0000 1
 0.19900E+06  0.24699E+05 0.11016E+02 0.56684E-03-0.64023E+07 0.68552E+02 3000.0000  5000.0000 1
2.  1 2.  6 0.  0 0.  0 0.  0 0.  0 0.  0JANAF 03/61                    C2H2
 0.54190E+05  0.48257E+05 0.18396E+02 0.76904E-03-0.40904E+07 0.84969E+02  500.0000  3000.0000 1
 0.54190E+05  0.48257E+05 0.20395E+02 0.38906E-03-0.64530E+07 0.84969E+02 3000.0000  5000.0000 1
2. 55-0. -0-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 06/68          AFWL-JEF    CS2
 0.25400E+05  0.27341E+05 0.79421E+01 0.12238E-02 0.22034E+06 0.90329E+02  500.0000  3000.0000 1
 0.25400E+05  0.27341E+05 0.11093E+02 0.82771E-03-0.17443E+08 0.90329E+02 3000.0000  6000.0000 1
1.  1 1.  8 1. 55-0. -0-0. -0-0. -0-0. -0ATLANTIC RESEARCH  AFWL-NV     CSOH
-0.56100E+05  0.36987E+05 0.13980E+02 0.53925E-03-0.22203E+06 0.91364E+02  500.0000  3000.0000 1
-0.56100E+05  0.36987E+05 0.14809E+02 0.47701E-04-0.34118E+07 0.91364E+02 3000.0000  6000.0000 1
1.  1 1.  7 2.  8 0.  0 0.  0 0.  0 0.  0JANAF  06/63       AFWL - WRS  HNO2 CIS
-0.18340E+05  0.46880E+05 0.16383E+02 0.91558E-03-0.10798E+07 0.96254E+02  500.0000  3000.0000 1
-0.18340E+05  0.46880E+05 0.18343E+02 0.22128E-03 0.38625E+07 0.96254E+02 3000.0000  5000.0000 1
1.  1 1.  7 2.  8 0.  0 0.  0 0.  0 0.  0JANAF  06/63       AFWL - WRS  HNO2 TRA
-0.18840E+05  0.46884E+05 0.16382E+02 0.92650E-03-0.10272E+07 0.96288E+02  500.0000  3000.0000 1
-0.18840E+05  0.46884E+05 0.18323E+02 0.22408E-03 0.37801E+07 0.96288E+02 3000.0000  5000.0000 1
1.  1 1.  8 0.  0 0.  0 0.  0 0.  0 0.  0JANAF 12/60                     HO
 0.93300E+04  0.21404E+05 0.77319E+01 0.39439E-03-0.97356E+06 0.61382E+02  500.0000  3000.0000 1
 0.93300E+04  0.21404E+05 0.96514E+01-0.44353E-04-0.68611E+07 0.61382E+02 3000.0000  5000.0000 1
2.  1 1.  8 0.  0 0.  0 0.  0 0.  0JANAF 03/61                    H2O
-0.57793E+05  0.30201E+05 0.11225E+02 0.81140E-03-0.26080E+07 0.68421E+02  500.0000  3000.0000 1
-0.57793E+05  0.30201E+05 0.15728E+02-0.19155E-03-0.17360E+08 0.68421E+02 3000.0000  5000.0000 1
1.  7 1.  8 0.  0 0.  0 0.  0 0.  0 0.  0JANAF 06/63                     NO
 0.21580E+05  0.22700E+05 0.87762E+01 0.89903E-04-0.78966E+06 0.68849E+02  500.0000  3000.0000 1
 0.21580E+05  0.22700E+05 0.91626E+01 0.65788E-05-0.21252E+07 0.68849E+02 3000.0000  5000.0000 1
2.  8 0.  0 0.  0 0.  0 0.  0 0.  0 0.  0ABBETT LOW TEMP                  O2
 0.E+00       0.14650E+05 0.81987E+01-0.16790E-02-0.E+00       0.63228E+02   -0.0000   500.0000 1
 0.E+00       0.23446E+05 0.80869E+01 0.49703E-03-0.24293E+06 0.67973E+02   -0.0000  3000.0000 1
1. 55-1. 99-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 06/68          AFWL-JEF    CS+1
 0.10810E+06  0.13423E+05 0.49680E+01 0.E+00       0.21521E-06 0.52035E+02  500.0000  3000.0000 1
 0.10810E+06  0.13423E+05 0.49680E+01 0.E+00      -0.62351E-04 0.52035E+02 3000.0000  6000.0000 1
1.  6-1. 99 0.  0 0.  0 0.  0 0.  0 0.  0CONVAIR ZPH-122 12/61           C+
 0.42899E+06  0.15012E+05 0.48366E+01 0.18070E-04 0.34000E+05 0.48423E+02 2000.0000 10000.0000 1
 0.42899E+06  0.15012E+05 0.48366E+01 0.18070E-04 0.34000E+05 0.48423E+02 2000.0000 10000.0000 1
1.  1-1. 99-0. -0-0. -0-0. -0-0. -0-0. -0AFWL TDR 64-44 NORM TO 298 JEFH+1
 0.36716E+06  0.13423E+05 0.49679E+01-0.59624E-05-0.30407E-06 0.37482E+02  500.0000  3000.0000 1
 0.36716E+06  0.13423E+05 0.49673E+01-0.26722E-05-0.11342E-04 0.37482E+02 3000.0000  5000.0000 1
1.  7-1. 99 0.  0 0.  0 0.  0 0.  0 0.  0CONVAIR ZPH-122 12/61           N+
 0.44664E+06  0.15131E+05 0.50175E+01 0.61710E-04-0.18410E+07 0.49685E+02 2000.0000 10000.0000 1
 0.44664E+06  0.15131E+05 0.50175E+01 0.61710E-04-0.18410E+07 0.49685E+02 2000.0000 10000.0000 1
2.  8 1. 99 0.  0 0.  0 0.  0 0.  0 0.  0CONVAIR ZPH-122 12/61           O2-
-0.20525E+05  0.26757E+05 0.11148E+02-0.65670E-04-0.77910E+07 0.69915E+02 2000.0000 10000.0000 1
-0.20525E+05  0.26757E+05 0.11148E+02-0.65670E-04-0.77910E+07 0.69915E+02 2000.0000 10000.0000 1
1.  6 1.  8-1. 99 0.  0 0.  0 0.  0 0.  0CONVAIR ZPH-122 12/61           CO+
 0.29424E+06  0.24393E+05 0.89362E+01 0.37800E-04-0.15090E+07 0.66660E+02 2000.0000 10000.0000 1
 0.29424E+06  0.24393E+05 0.89362E+01 0.37900E-04-0.15090E+07 0.66660E+02 2000.0000 10000.0000 1
1.  7 1.  8-1. 99 0.  0 0.  0 0.  0 0.  0CONVAIR ZPH-122 12/61           NO+
 0.23292E+06  0.24197E+05 0.91122E+01 0.27740E-04-0.31661E+07 0.65438E+02 2000.0000 10000.0000 1
 0.23292E+06  0.24197E+05 0.91122E+01 0.27740E-04-0.31660E+07 0.65438E+02 2000.0000 10000.0000 1
1.  8-1. 99 0.  0 0.  0 0.  0 0.  0 0.  0CONVAIR ZPH-122 12/61           O+
 0.37203E+06  0.14929E+05 0.33627E+01 0.30671E-03 0.59023E+07 0.48485E+02 2000.0000 10000.0000 1
 0.37203E+06  0.14929E+05 0.33627E+01 0.30671E-03 0.59023E+07 0.48485E+02 2000.0000 10000.0000 1
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ELEMENT	HYDROGEN	CARBON	NITROGEN	OXYGEN	CESIUM	ELECTRON
BASE SP	H2	CO	N2	CO2	CS	E-

MOLECULAR TRANSPORT PROPERTIES
VISCOSITY ..... BUDDENBERG - WILKE MIXTURE FORMULA WITH MU(I) CALCULATED ON THE BASIS OF D(I,I) = DBAR/G(I)**2

THERMAL CONDUCTIVITY ..... MASON - SAXENA MIXTURE FORMULA WITH EUCKEN CORRECTION

DIFFUSION COEFFICIENTS ..... D(I,J) = DBAR/(F(I)*F(J)) WITH DBAR BASED ON SIGMA = 3.4670, EPOVRK = 106.7000, AND MREF = 32.0000

METHODS EMPLOYED

0 CONDENSED PHASE, VALUES FOR F(I) AND G(I) SET EQUAL TO 1.E+10

1 VALUES FOR F(I) (OR G(I)) INPUT DIRECTLY

2 VALUES FOR F(I) (OR G(I)) CALCULATED BY F(I) = (M(I)/FITMOL)**FFA AND G(I) = (M(I)/FITGMW)**GGA WHERE M(I) IS SPECIES MOLECULAR WEIGHT, FITMOL = 26.7000, AND FFA = 0.4890, FITGMW = 24.3000, AND GGA = 0.4560

3 VALUES FOR G(I) CALCULATED BY G(I) = SQRT(DBAR/D(I,I)) = (SIGMA(I)/SIGMA) * (EPS(I)/EPOVRK) **0.0795 * (M(I)/MREF) **0.25 WHERE SIGMA(I) AND EPS(I) ARE GIVEN WITH THERMODYNAMIC DATA

SPECIES	F(I)	METHOD	G(I)	METHOD	SPECIES	F(I)	METHOD	G(I)	METHOD
CS	2.192	2	2.163	2	H2	0.283	2	0.323	2
CO	1.024	2	1.067	2	CO2	1.277	2	1.310	2
N2	1.024	2	1.067	2	E-	0.005	2	0.008	2
C	0.677	2	0.726	2	H	0.201	2	0.236	2
O	0.778	2	0.827	2	N	0.729	2	0.779	2
C3	1.158	2	1.196	2	CH4	0.780	2	0.828	2
CN	0.987	2	1.032	2	CH	0.704	2	0.753	2
CHN	1.086	2	1.049	2	CHO	1.042	2	1.084	2
C2	0.950	2	0.995	2	C2H2	0.988	2	1.032	2
CS2	3.077	2	2.963	2	CSOH	2.325	2	2.284	2
HNO2 CIS	1.319	2	1.349	2	HNO2 TRA	1.319	2	1.349	2
HO	0.902	2	0.953	2	H2O	0.825	2	0.873	2
NO	1.059	2	1.101	2	O2	1.093	2	1.133	2
CS+1	2.192	2	2.163	2	C+	0.677	2	0.726	2
H+1	0.201	2	0.236	2	N+	0.729	2	0.779	2
C2-	1.093	2	1.133	2	CO+	1.024	2	1.067	2
NO+	1.059	2	1.101	2	O+	0.778	2	0.827	2

STAGNATION SOLUTION FOLLOWED BY BOUNDARY-LAYER EDGE EXPANSION

STREAM FUNCTION,LB/SEC	0.E+00	0.10891E+00	0.43554E+00	0.96576E+00	0.17504E+01	0.28427E+01	0.39921E+01	0.54704E+01
	0.74953E+01	0.11510E+02	0.17138E+02	0.24266E+02	0.42455E+02	0.69217E+02	0.97424E+02	0.13477E+03
	0.17833E+03	0.27934E+03	0.53967E+03	0.88191E+03				
SHOCK ANGLE,RADIANS	0.E+00	0.35540E+00	0.68590E+00	0.93530E+00	0.10980E+01	0.11971E+01	0.12488E+01	0.12862E+01
	0.13126E+01	0.13451E+01	0.13587E+01	0.13692E+01	0.13809E+01	0.13737E+01	0.13631E+01	0.13587E+01
	0.13566E+01	0.13545E+01	0.13537E+01	0.13535E+01				

CP-FROZEN	CP-EQUIL	DLNM/DLNT	DLNM/DLNP	GAMMA
0.30755E+00	0.35756E+00	-0.10782E-01	0.47496E-03	0.12444E+01

TEMP = 2681.4493 DEG-K PRES = 59.1140 ATM MOL WT = 28.8329163
RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
ENTHALPY = 0.7059333E+03 CAL/GM ENTROPY = 0.19727E+01 CAL/GM-DEG K
DENSITY = 0.483521E+00 LB/CUFT
VEL = 0.E+00 FT/SEC MACH = 0.E+00 AREA = 0.E+00 SQFT/LB/SEC

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
CS	0.E+00	H2	0.E+00	CO	0.E+00
CO2	0.E+00	N2	0.77186E+00	E-	0.19994E-09
C	0.E+00	H	0.E+00	O	0.19032E-02
N	0.15888E-06	C3	0.E+00	CH4	0.E+00
CN	0.E+00	OH	0.E+00	CHN	0.E+00
CHO	0.E+00	C2	0.E+00	C2H2	0.E+00
CS2	0.E+00	CSOH	0.E+00	HNO2 CIS	0.E+00
HNO2 TRA	0.E+00	HO	0.E+00	H2O	0.E+00
NO	0.30384E-01	O2	0.19535E+00	CS+1	0.E+00
O+	0.E+00	H+1	0.E+00	N+	0.44648E-23
O2-	0.48007E-09	CO+	0.E+00	NO+	0.68000E-09
O+	0.60525E-18				

TEMP = 374.3826 DEG-K PRES = 2.3974 ATM MOL WT = 28.8603826
RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
ENTHALPY = 0.2099507E+02 CAL/GM ENTROPY = 0.16422E+01 CAL/GM-DEG K
DENSITY = 0.140584E+00 LB/CUFT

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
CS	0.E+00	H2	0.E+00	CO	0.E+00
CO2	0.E+00	N2	0.78806E+00	E-	0.E+00
C	0.E+00	H	0.E+00	O	0.57611E-32
N	0.71343E-63	C3	0.E+00	CH4	0.E+00
CN	0.E+00	CH	0.E+00	CHN	0.E+00
CHO	0.E+00	C2	0.E+00	C2H2	0.E+00
CS2	0.E+00	CSOH	0.E+00	HNO2 CIS	0.E+00
HNO2 TRA	0.E+00	HO	0.E+00	H2O	0.E+00
NO	0.40173E-12	O2	0.21194E+00	CS+1	0.E+00
C+	0.E+00	H+1	0.E+00	N+	0.E+00
O2-	0.E+00	CO+	0.E+00	NO+	0.E+00
O+	0.E+00				

TEMP = 2637.8300 DEG-K PRES = 55.2652 ATM MOL WT = 28.8368324
RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
ENTHALPY = 0.6904347E+03 CAL/GM ENTROPY = 0.19715E+01 CAL/GM-DEG K
DENSITY = 3.459577E+00 LB/CUFT

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
CS	0.E+00	H2	0.E+00	CO	0.E+00
CO2	0.E+00	N2	0.77292E+00	E-	0.13934E-09
C	0.E+00	H	0.E+00	O	0.16321E-02
N	0.11503E-06	C3	0.E+00	CH4	0.E+00
CN	0.E+00	CH	0.E+00	CHN	0.E+00
CHC	0.E+00	C2	0.E+00	C2H2	0.E+00
CS2	0.E+00	CSOH	0.E+00	HNO2 CIS	0.E+00
HNO2 TRA	0.E+00	HO	0.E+00	H2O	0.E+00
NO	0.28989E-01	O2	0.19646E+00	CS+1	0.E+00
C+	0.E+00	H+1	0.E+00	N+	0.16821E-23
O2-	0.34581E-09	CO+	0.E+00	NO+	0.48575E-09
O+	0.28874E-18				

CP-FROZEN	CP-EQUIL	DLNM/DLNT	DLNM/DLNP	G4444A
0.28712E+00	0.28987E+00	-0.14991E-05	0.33329E-07	0.13115E+01

TEMP = 1357.8166 DEG-K PRES = 2.6298 ATM MOL WT = 28.8603807
RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
ENTHALPY = 0.28437515E+03 CAL/GM ENTROPY = 0.19727E+01 CAL/GM-DEG K
DENSITY = 0.42544BE-01 LB/CUFT
VEL = 0.616E+04 FT/SEC MACH = 0.262E+01 AREA = 0.381E-02 SQFT/LB/SEC

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
CS	0.E+00	H2	0.E+00	CO	0.E+00
CO2	0.E+00	N2	0.78774E+00	E-	0.11214E-16
C	0.E+00	H	0.E+00	O	0.13332E-06
N	3.58[illegible]E-15	O3	0.E+00	CH4	0.E+00
CN	0.E+00	CH	0.E+00	CHN	0.E+00
CHO	0.E+00	C2	0.E+00	C2H2	0.E+00
CS2	0.E+00	OSOH	0.E+00	HNO2 CIS	0.E+00
HNC2 TRA	0.E+00	HO	0.E+00	H2O	0.E+00
NO	0.62382E-03	O2	0.21162E+00	CS+1	0.E+00
C+	0.E+00	H+1	0.E+00	N+	0.31599E-48
O2-	0.13359E-17	CO+	0.E+00	NO+	0.14481E-17
O+	0.46186E-37				

DISTANCE,FT	0.E+00	0.40[illegible]0E-02	0.80000E-02	0.12000E-01	0.17000E-01	0.27000E-01	0.38[illegible]0E-01	[illegible]0E-01
	0.54915E-01	0.69[illegible]6E-01	0.87000E-01	0.90000E-01	0.10650E+00	0.13686E+00	0.19206E+00	0.27[illegible]3E+00
	0.36[illegible]0E+00	0.44518E+00	0.61392E+00	0.78267E+00	0.95141E+00	0.12045E+01	0.14000E+01	0.15[illegible]0E+01
	0.15[illegible]0E+01	0.16234E+01	0.16961E+01	0.17677E+01	0.18393E+01	0.19639E+01		
ROKAP	0.E+00	0.39939E-02	0.79509E-02	0.11835E-01	0.16532E-01	0.25150E-01	0.32947E-01	0.3o748E-01
	0.41154E-01	0.42733E-01	0.44454E-01	0.46018E-01	0.48599E-01	0.48656E-01	0.61984E-01	0.75162E-01
	0.88381E-01	0.10158E+00	0.12798E+00	0.15438E+00	0.18077E+00	0.22836E+00	0.29095E+00	0.27472E+00
	0.27641E+00	0.28590E+00	0.29727E+00	0.30848E+00	0.31967E+00	0.33916E+00		
XI,(LB/SEC)**2	0.E+0.	0.14929E-09	0.25435E-08	0.11027E-07	0.42910E-07	0.21506E-06	0.58324E-06	0.8>299E-06
	0.12516E-05	0.14638E-05	0.17307E-05	0.19548E-05	0.23303E-05	0.23388E-05	0.46040E-05	0.7>149E-05
	0.11354E-04	0.16393E-04	0.31191E-04	0.54259E-04	0.87993E-04	0.16352E-03	0.24630E-03	0.32760E-03
	0.33749E-03	0.37137E-03	0.41977E-03	0.47146E-03	0.52716E-03	0.63435E-03		
PRESSURE RATIO	0.1[illegible]3E+01	0.98938E+00	0.95708E+00	0.90543E+00	0.81812E+00	0.59897E+00	0.35254E+00	0.22746E+00
	0.75363E-01	0.71960E-01	0.67962E-01	0.64438E-01	0.59238E-01	0.59126E-01	0.43652E-01	0.37947E-01
	0.35154E-01	0.35302E-01	0.36110E-01	0.37829E-01	0.39577E-01	0.41609E-01	0.42712E-01	0.43350E-01
	0.43753E-01	0.43601E-01	0.43828E-01	0.44029E-01	0.44211E-01	0.44487E-01		
STATIC PRESSURE,ATM	0.59114E+02	0.58481E+02	0.56577E+02	0.53524E+02	0.48362E+02	0.35408E+02	0.20840E+02	0.13446E+02
	0.44358E+01	0.42538E+01	0.40175E+01	0.38042E+01	0.35013E+01	0.34952E+01	0.25884E+01	0.22432E+01
	0.21195E+01	0.20866E+01	0.21345E+01	0.22362E+01	0.23396E+01	0.24597E+01	0.25249E+01	0.25626E+01
	0.25670E+01	0.25774E+01	0.25906E+01	0.26027E+01	0.26135E+01	0.26298E+01		
EDGE VELOCITY,FT/SEC	0.E+00	0.42289E+03	0.85270E+03	0.12798E+04	0.18102E+04	0.28483E+04	0.39569E+04	0.46129E+04
	0.57644E+04	0.58043E+04	0.59502E+04	0.58921E+04	0.59568E+04	0.59581E+04	0.61754E+04	0.62602E+04
	0.63345E+04	0.63143E+04	0.63008E+04	0.62702E+04	0.62408E+04	0.62077E+04	0.61901E+04	0.61801E+04
	0.618 1[illegible]+04	0.61762E+04	0.61727E+04	0.61696E+04	0.61668E+04	0.61625E+04		
BETA	0.50000E+00	0.49295E+00	0.53162E+00	0.48883E+00	0.52990E+00	0.60778E+00	0.76728E+00	0.10233E+01
	0.81938E+00	-0.10374E+00	0.11466E+00	0.12160E+00	0.12443E+00	0.12264E+00	0.80745E-01	0.37907E-01
	0.14281E-01	0.35259E-03	-0.14841E-01	-0.19938E-01	-0.19138E-01	-0.15258E-01	-0.12171E-01	-0.1u8u7E-01
	-0.78864E-03	-0.16155E-01	-0.87094E-02	-0.83966E-02	-0.78907E-02	-0.69349E-02		
INCIDENT RADIATION FLUX	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00		
ENTROPY GROP,1TU/LB R	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00		
-1/FLOW NORM. PARAMETER	-0.47128E+00	-0.44950E+00	-0.47671E+00	-0.46795E+00	-0.51352E+00	-0.64329E+00	-0.95102E+00	-0.13274E+01
	-0.31962E+01	-0.34382E+01	-0.37582E+01	-0.40233E+01	-0.44461E+01	-0.44552E+01	-0.62573E+01	-0.73854E+01
	-0.42[illegible]4E+01	-0.85640E+01	-0.92046E+01	-0.96892E+01	-0.10156E+02	-0.10905E+02	-0.11[illegible]	-0.11976E+02
	-0.12[illegible]8E+02	-0.12196E+02	-0.12418E+02	-0.12636E+02	-0.12850E+02	-0.13220E+02		
WALL TEMPERATURE,DEG R	0.5[illegible]0E+04	0.52000E+04	0.50000E+04	0.47000E+04	0.44000E+04	0.40000E+04	0.37000E+04	0.32000E+04
	0.28[illegible]0E+04	0.26000E+04	0.24000E+04	0.23000E+04	0.16000E+04	0.15220E+04	0.15130E+04	0.15000E+04
	0.15[illegible]0E+04	0.14990E+04	0.14980E+04	0.15020E+04	0.15050E+04	0.15090E+04	0.15100E+04	0.15100E+04
	0.15000E+04	0.15000E+04	0.15000E+04	0.15000E+04	0.15000E+04	0.15000E+04		

COMP FLUX,LB/SEC FT**2	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00		
COMP FLUX,LB/SEC FT**2	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00		
COMP FLUX,LB/SEC FT**2	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.65000E+00	0.58500E+00	0.55000E+00
	0.52000E+00	0.49000E+00	0.48200E+00	0.49500E+00	0.51800E+00	0.53900E+00	0.54900E+00	0.55000E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00		

CASE 1 - - - - - - - - - - - - STREAMWISE DIMENSION 3.E+00 FEET - - - -

ITS	TIME	ALPH	FPPW	DAT* ERROR	MAX.LIN MOMENTUM	MAX.ERRORS IN CONSERVATION EQS. ENERGY	CS		HE		CO		CO2		
1	13.941	3.611	0.72518	8.21**	1E+00	16-2.9E+00	13	1.3E+02	2	0.E+00	2	0.E+00	1	2.8E-03	1-4.3E-03	6
2	19.342	3.248	3.73516	2.2154	1E+00	16-2.1E+00	13	9.1E+01	2	0.E+00	2	0.E+00	1	2.1E-03	1-3.4E-03	0
3	24.447	2.916	3.75718	2.2666	9E-01	16-1.4E+00	1	-7.2E+01	2	0.E+00	2	0.E+00	1	1.2E-03	1-1.9E-03	0
4	29.612	2.624	3.79670	3.3226	7E-01	16-9.4E-01	1	-5.6E+01	2	0.E+00	2	0.E+00	1	6.3E-04	1-9.8E-04	0
5	34.758	2.362	3.85810	4.4195	4E-01	16-6.2E-01	1	-4.1E+01	2	0.E+00	2	0.E+00	14	3.2E-04	14-5.0E-04	0
6	39.834	2.126	3.92720	6.3811	3E-01	16-3.4E-01	1	-2.6E+01	2	0.E+00	2	0.E+00	11	1.7E-04	11 4.7E-04	0
7	45.414	1.946	3.99691.30		9E-02	16-1.2E-01	1	-1.0E+01	2	0.E+00	2	0.E+00	11	2.2E-04	11 3.4E-04	0
8	50.316	1.903	3.99741.60**		6E-05	16-2.5E-03	15	-6.1E-01	2	0.E+00	2	0.E+00	13	7.9E-05	13 1.2E-04	0
9	54.756	1.903	3.99741.80**		1E-06	17-3.6E-05	11	-1.1E-02	2	0.E+00	2	0.E+00	14	6.8E-06	14 1.1E-05	0

ALPHA	XI (LB /SEC)** 2	ROKAP (FT)	PRESSURE (ATM)	EDGE VELOCITY (FT/SEC)	BETA	FLUX NORMALIZING PARAMETER	DIFFUSIONAL	TOT ENTH (BTU/SEC SQ FT)	RERAD	QCOND
1.161E+00	0.E+00	0.E+00	5.911E+01	0.E+00	5.000E-01	2.122E+00	-3.131E+02	-3.131E+02	0.E+00	-2.412E+02

WALL SHEAR (LB/SQ FT)	MECH REM	MASS FLUXES PYROL GAS (LB/SEC SQ FT)	CHAR	TOTAL GAS	ELEMENTAL MASS DIFFUSIVE FLUXES (LB/SEC SQ FT) FOR HYDROGEN	CARBON	NITROGEN	OXYGEN	CESIUM
0.E+00	2.E+00	3.E+00	0.E+00	0.E+00	0.E+00	1.433E-14	1.765E-05	-1.705E-05	0.E+00

MOM TRANS COEFF, RHO*UE*CH/2	HEAT TRANS COEFF, RHO*UE*CH	BLOWING PARAMETERS (BASED ON CH) FOR PYROL GAS	CHAR	TOTAL GAS	ELEMENTAL MASS TRANSFER COEFFICIENTS, RHOE*UE*CH (LB/SEC SQ FT) FOR HYDROGEN	CARBON	NITROGEN	OXYGEN	CESIUM
2.234E+01	1.459E+00	0.E+00	0.E+00	0.E+00	IIIII	5.834E+01	-1.685E-02	-1.685E-02	IIIII

MOMENTUM THICKNESS, THETA (FT)	DISPLACE. THICKNESS, DELSTAR (FT)	EFFECTIVE BODY DISPLACE. (FT)	ENTHALPY THICKNESS, LAMBDA (FT)	REYNOLDS NUMBER PER FOOT	MASS THICKNESSES (FT) FOR HYDROGEN	CARBON	NITROGEN	OXYGEN	CESIUM
6.190E-04	1.974E-03	1.971E-03	1.542E-03	0.E+00	IIIII	-2.166E-04	-6.078E-07	-6.078E-07	IIIII

LOCAL INFORMATION

DISTANCE, FROM WALL (FT)	ETA	F	FP (MU/UE)	FPP	SHEAR (LB/FTSQ)	TOTAL ENTHALPY,G (BTU/LB)	GP (BTU/LB)	GPP (BTU/LB)	STATIC ENTHALPY (BTU/LB)	TEMP (DEG R)	ELECTRON COLL FREQ (1/SEC)
1.E+00	1.E+00	0.E+00	0.E+00	9.374E-01	0.E+00	1.485E+03	-1.128E+02	-3.998E-01	1.485E+03	5.403E+03	6.275E+12
9.967E-01	3.967E-03	7.841E-06	3.952E-03	9.350E-01	0.E+00	1.485E+03	-1.028E+02	2.188E+00	1.485E+03	5.399E+03	6.275E+12
1.993E-01	7.934E-03	3.134E-05	7.894E-03	9.926E-01	0.E+00	1.484E+03	-1.028E+02	-3.893E-01	1.484E+03	5.399E+03	6.270E+12
3.984E-01	1.585E-02	9.514E-05	1.579E-02	9.490E-01	0.E+00	1.484E+03	-1.028E+02	2.196E+00	1.484E+03	5.396E+03	6.277E+12
5.977E-01	2.381E-02	2.141E-04	2.357E-02	9.331E-01	0.E+00	1.483E+03	-1.028E+02	-3.694E-01	1.483E+03	5.394E+03	6.274E+12
7.969E-01	3.967E-02	7.715E-04	3.969E-02	9.735E-01	0.E+00	1.481E+03	-1.028E+02	2.240E+00	1.481E+03	5.390E+03	6.281E+12
1.197E-00	5.953E-02	4.746E-03	5.921E-02	9.617E-01	0.E+00	1.479E+03	-1.027E+02	-2.681E-01	1.479E+03	5.384E+03	5.284E+12
2.394E-00	9.917E-02	9.617E-03	9.797E-02	3.340E-01	0.E+00	1.475E+03	-1.027E+02	2.534E+00	1.475E+03	5.374E+03	6.294E+12
4.989E-00	1.983E-01	1.941E-02	1.960E-01	1.791E-01	0.E+00	1.465E+03	-1.025E+02	8.947E-01	1.465E+03	5.348E+03	6.305E+12
9.979E-00	3.967E-01	7.226E-02	3.490E-01	7.633E-01	0.E+00	1.444E+03	-1.017E+02	7.086E+00	1.444E+03	5.296E+03	6.336E+12
1.796E-01	4.964E-01	9.274E-01	4.738E-01	5.972E-01	0.E+00	1.415E+03	-9.866E+01	1.356E+01	1.415E+03	5.218E+03	6.384E+12
2.993E-01	9.917E-01	3.914E-01	7.858E-01	4.453E-01	0.E+00	1.346E+03	-9.253E+01	2.767E+01	1.386E+03	5.142E+03	6.434E+12
4.789E-01	1.983E+00	1.240E+00	1.236E-01	1.111E-01	0.E+00	1.312E+03	-5.902E+01	5.201E+01	1.312E+03	4.914E+03	6.564E+12
7.184E-01	3.474E+00	3.424E+00	1.966E+00	7.973E-03	0.E+00	1.277E+03	-1.283E+01	1.087E+01	1.277E+03	4.845E+03	6.625E+12
1.196E-00	4.959E+00	4.227E+00	1.413E+00	3.099E-03	0.E+00	1.270E+03	0.E+00	-1.725E+00	1.270E+03	4.827E+03	6.637E+12

DISTANCE FROM WALL (FT)	DENSITY, RHO (LB/CU FT)	VISCOSITY, MU /RHOE*MUE, (LB/SEC FT	RHO*MU SPECIFIC HEAT C	(BTU/LB R)	THERMAL COND (BTU /SEC FT R)	PRANDTL NUMBER	MODIFIED SCHMIDT NUMBER	MOLECULAR WEIGHT	RHO*D*EPS /RHOE*MUE	MACH NUMBER

```
0.E+00     4.312E-01 5.124E-05 9.610E-01 3.116E-01 2.320E-05 6.883E-01 6.958E-01 2.877E+01 0.E+00     0.E+00
9.957E-08  4.313E-01 5.123E-05 9.610E-01 3.116E-01 2.319E-05 6.883E-01 6.958E-01 2.877E+01 0.E+00     0.E+00
1.993E-07  4.314E-01 5.123E-05 9.611E-01 3.116E-01 2.319E-05 6.883E-01 6.958E-01 2.877E+01 0.E+00     0.E+00
3.488E-07  4.315E-01 5.122E-05 9.612E-01 3.116E-01 2.318E-05 6.883E-01 6.958E-01 2.877E+01 0.E+00     0.E+00
5.977E-07  4.317E-01 5.122E-05 9.614E-01 3.116E-01 2.317E-05 6.883E-01 6.958E-01 2.877E+01 0.E+00     0.E+00
9.958E-07  4.320E-01 5.117E-05 9.616E-01 3.115E-01 2.316E-05 6.883E-01 6.958E-01 2.877E+01 0.E+00     0.E+00
1.493E-06  4.325E-01 5.114E-05 9.620E-01 3.115E-01 2.314E-05 6.883E-01 6.958E-01 2.877E+01 0.E+00     0.E+00
2.486E-06  4.333E-01 5.107E-05 9.627E-01 3.114E-01 2.311E-05 6.883E-01 6.958E-01 2.877E+01 0.E+00     0.E+00
4.959E-06  4.355E-01 5.092E-05 9.644E-01 3.112E-01 2.302E-05 6.883E-01 6.958E-01 2.878E+01 0.E+00     0.E+00
9.869E-06  4.399E-01 5.054E-05 9.670E-01 3.109E-01 2.285E-05 6.882E-01 6.957E-01 2.878E+01 0.E+00     0.E+00
1.714E-05  4.467E-01 5.008E-05 9.730E-01 3.103E-01 2.259E-05 6.881E-01 6.957E-01 2.879E+01 0.E+00     0.E+00
2.430E-05  4.534E-01 4.963E-05 9.781E-01 3.098E-01 2.233E-05 6.880E-01 6.956E-01 2.880E+01 0.E+00     0.E+00
4.749E-05  4.722E-01 4.839E-05 9.919E-01 3.084E-01 2.165E-05 6.878E-01 6.954E-01 2.883E+01 0.E+00     0.E+00
7.447E-05  4.917E-01 4.767E-05 9.987E-01 3.077E-01 2.133E-05 6.877E-01 6.953E-01 2.883E+01 0.E+00     0.E+00
1.145E-04  4.835E-01 4.755E-05 1.000E+00 3.076E-01 2.127E-05 6.876E-01 6.953E-01 2.883E+01 0.E+00     0.E+00

                              DISTANCE FROM WALL,FT
          0.E+00    9.957E-08 1.993E-07 3.488E-07 5.977E-07 9.958E-07 1.493E-06 2.486E-06 4.959E-06 9.869E-06
              1.714E-05 2.430E-05 4.749E-05 7.447E-05 1.145E-04

ELEMENTAL FRACTIONS AND THEIR FIRST AND SECOND DERIVATIVES WITH RESPECT TO ETA

 CS       0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
              0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
          0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
              0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
          0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
              0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
 H2       0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
              0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
          0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
              0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
          0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
              0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
 CO      -4.096E-01-4.096E-01-4.097E-01-4.097E-01-4.097E-01-4.097E-01-4.097E-01-4.098E-01-4.099E-01-4.102E-01
              -4.107E-01-4.110E-01-4.116E-01-4.116E-01-4.114E-01
         -1.567E-03-1.566E-03-1.565E-03-1.563E-03-1.561E-03-1.557E-03-1.552E-03-1.543E-03-1.517E-03-1.453E-03
              -1.318E-03-1.097E-03-2.806E-04 1.620E-04 0.E+00
         -2.252E-05 5.031E-04-1.980E-05 5.030E-04-1.903E-05 5.036E-04-1.708E-05 5.101E-04 1.213E-05 6.313E-04
              3.297E-04 1.180E-03 7.003E-04-9.743E-05-8.502E-05
 CO2      6.436E-01 6.476E-01 6.436E-01 6.437E-01 6.437E-01 6.437E-01 6.438E-01 6.439E-01 6.441E-01 6.446E-01
              6.452E-01 6.458E-01 6.467E-01 6.466E-01 6.464E-01
          2.462E-03 2.461E-03 2.459E-03 2.457E-03 2.453E-03 2.447E-03 2.429E-03 2.424E-03 2.383E-03 2.283E-03
              2.058E-03 1.724E-03 3.152E-04-2.559E-04 0.E+00
          3.534E-05-7.997E-04 2.986E-05-7.903E-04 2.989E-05-7.913E-04 2.684E-05-8.014E-04-1.905E-05-9.919E-04
              -5.141E-04-1.720E-03-1.113E-03 1.531E-04 1.336E-04
 N2       7.660E-01 7.660E-01 7.660E-01 7.660E-01 7.660E-01 7.660E-01 7.660E-01 7.659E-01 7.658E-01 7.657E-01
              7.654E-01 7.652E-01 7.649E-01 7.649E-01 7.650E-01
         -8.950E-04-8.944E-04-8.939E-04-8.931E-04-8.917E-04-8.895E-04-8.867E-04-8.811E-04-8.664E-04-8.299E-04
              -7.483E-04-6.268E-04-1.146E-04 9.302E-05 0.E+00
         -1.296E-05 2.874E-04-1.086E-05 2.873E-04-1.087E-05 2.877E-04-9.750E-06 2.914E-04 6.926E-06 3.606E-04
              1.884E-04 6.283E-04 4.046E-04-5.565E-05-4.856E-05

MOLE FRACTIONS

 CS       0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
              0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
 H2       0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
              0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
 CO       0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
              0.E+00     0.E+00     0.E+00     0.E+00     0.E+00
```

CO2	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
N2	7.636E-01	7.636E-01	7.636E-01	7.637E-01	7.637E-01	7.638E-01	7.638E-01	7.640E-01	7.644E-01	7.651E-01	7.663E-01
	7.673E-01	7.701E-01	7.715E-01	7.719E-01							
E-	2.832E-09	2.827E-09	2.808E-09	2.790E-09	2.761E-09	2.714E-09	2.656E-09	2.544E-09	2.282E-09	1.828E-09	1.302E-09
	9.279E-10	3.577E-10	2.199E-10	1.999E-10							
C	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
H	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
O	6.275E-03	6.263E-03	6.251E-03	6.233E-03	6.203E-03	6.156E-03	6.097E-03	5.980E-03	5.696E-03	5.156E-03	4.428E-03
	3.803E-03	2.475E-03	1.937E-03	1.903E-03							
N	1.571E-06	1.565E-06	1.559E-06	1.550E-06	1.536E-06	1.513E-06	1.485E-06	1.431E-06	1.302E-06	1.074E-06	8.015E-07
	5.970E-07	2.622E-07	1.725E-07	1.589E-07							
C3	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
CH4	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
CN	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
CH	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
CHN	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
CHO	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
C2	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
C2H2	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
CS2	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
CSOH	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
HNO2 CIS	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
HNO2 TRA	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
HO	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
H2O	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
NO	4.581E-02	4.578E-02	4.575E-02	4.571E-02	4.564E-02	4.553E-02	4.539E-02	4.510E-02	4.440E-02	4.299E-02	4.091E-02
	3.691E-02	3.374E-02	3.134E-02	3.088E-02							
O2	1.843E-01	1.843E-01	1.843E-01	1.844E-01	1.844E-01	1.845E-01	1.847E-01	1.849E-01	1.855E-01	1.867E-01	1.884E-01
	1.900E-01	1.937E-01	1.951E-01	1.953E-01							
CS+1	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
C+	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
H+1	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
N+	3.202E-21	3.168E-21	3.135E-21	3.085E-21	3.003E-21	2.877E-21	2.727E-21	2.448E-21	1.865E-21	1.072E-21	4.602E-22
	1.982E-22	1.873E-23	5.645E-24	4.465E-24							
O2-	3.535E-09	3.524E-09	3.513E-09	3.497E-09	3.469E-09	3.426E-09	3.372E-09	3.266E-09	3.014E-09	2.557E-09	1.986E-09
	1.541E-09	7.493E-10	5.166E-10	4.801E-10							
CO+	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00						
NO+	6.368E-09	6.344E-09	6.321E-09	6.287E-09	6.230E-09	6.139E-09	6.028E-09	5.810E-09	5.296E-09	4.385E-09	3.288E-09
	2.469E-09	1.107E-09	7.365E-10	6.800E-10							
O+	9.429E-17	9.352E-17	9.275E-17	9.162E-17	8.976E-17	8.685E-17	8.335E-17	7.673E-17	6.227E-17	4.071E-17	2.129E-17
	1.115E-17	1.822E-18	7.249E-19	6.052E-19							

CASE 1 - - - - - - - - - - - - STREAMWISE DIMENSION 0.18393E+01 FEET - - - -

ITERATED VALUES ITS	TIME	ALPH	FPPW	DAMP	MAX.LIN ERROR	MAX. ERRORS IN CONSERVATION EQS. MOMENTUM	ENERGY	CS	H2	CO	CO2	
1	7.25431	0.211	3.84000	0.4999	5E-02	17-5.9E+01	2 1.6E+03	11 2.2E-01	11 1.2E-01	11 4.2E+00	11-3.4E+00	0
2	15.75529	0.998	3.77561	0.0000	2E-02	17-2.9E+01	2 1.3E+03	11 1.1E-01	3-7.8E-02	11 2.1E+00	11-1.7E+00	0
3	24.09829	0.984	3.65081	0.0000	5E-03	6-3.6E+00	3-8.5E+02	3 1.4E-02	3-1.8E-01	3 1.9E-01	3-7.2E-02	0
4	32.33629	0.957	3.67021	0.0000	1E-03	5 9.0E+00	3-3.8E+02	3 9.4E-03	3-5.1E-02	2-9.9E-02	2 1.4E-01	0
5	39.87629	0.948	3.66701	0.0000	1E-03	6 1.1E+00	2-3.1E+02	3 3.3E-03	3-2.4E-02	2-6.6E-02	2 8.4E-02	0
6	47.18729	0.944	3.67051	0.0000	5E-04	6 4.5E-01	2-1.7E+02	2 2.2E-03	2 9.6E-03	2-4.9E-02	2 6.5E-02	0
7	54.32429	0.943	3.67301	0.0000	2E-04	6 1.0E-01	2-5.9E+01	2 1.4E-03	2 4.0E-03	2-2.2E-02	2 2.9E-02	0
8	61.42629	0.942	3.67381	0.0000	8E-05	18-3.9E-02	2-8.9E+00	2 5.1E-04	2 1.4E-03	2-6.3E-03	2 7.9E-03	0
9	68.52929	0.942	3.67391	0.0000	3E-05	18-1.6E-02	2 2.8E+00	2 9.4E-05	3 2.5E-04	2-5.9E-04	2 5.5E-04	0
10	75.63129	0.942	3.67391	0.0000	1E-05	18-6.4E-03	2 2.5E+00	2-1.4E-05	3 8.6E-05	2 4.9E-04	2-7.1E-04	0
11	82.69829	0.942	3.67381	0.0000	6E-06	18-2.6E-03	2 9.7E-01	2-1.8E-05	2-5.9E-05	2 3.3E-04	2-4.4E-04	0
12	89.72729	0.942	3.67381	0.0000	2E-06	18-1.1E-03	2 2.1E-01	2-7.9E-06	2-2.3E-05	2 1.1E-04	2-1.4E-04	0
13	96.79329	0.942	3.67381	0.0000	9E-07	18-4.3E-04	3-8.2E-03	2-2.0E-06	2-5.2E-06	2 1.9E-05	2-2.3E-05	0
14	103.82329	0.942	3.67381	0.0000	4E-07	18-1.7E-04	2-2.8E-02	3 1.4E-07	3-1.3E-06	2-3.0E-06	2 4.9E-06	0

ALPHA	XI (LB /SEC)**2	ROKAP (FT)	PRESSURE (ATM)	EDGE VELOCITY (FT/SEC)	BETA	FLUX NORMALIZING PARAMETER	HEAT FLUXES DIFFUSIONAL	TOT ENTH (BTU/SEC SQ FT)	RERAD	QCOND
2.994E+01	5.272E-04	3.197E-01	2.613E+00	6.167E+03	-7.891E-03	7.782E-02	7.993E+02	7.993E+02	0.E+00	1.985E+02

WALL SHEAR (LB/SQ FT)	MECH REM	MASS FLUXES PYROL GAS (LB/SEC SQ FT)	CHAR	TOTAL GAS	ELEMENTAL MASS DIFFUSIVE FLUXES (LB/SEC SQ FT) FOR HYDROGEN	CARBON	NITROGEN	OXYGEN	CESIUM
6.522E+01	0.E+00	0.E+00	0.E+00	0.E+00	-8.991E-08	3.285E-08	-9.819E-08	1.524E-07	2.893E-09

MOM TRANS COEFF, RHO*UE*CF/2	HEAT TRANS COEFF, RHO*UE*CH	BLOWING PARAMETERS (BASED ON CH) FOR PYROL GAS	CHAR	TOTAL GAS	ELEMENTAL MASS TRANSFER COEFFICIENTS, RHOE*UE*CM (LB/SEC SQ FT) FOR HYDROGEN	CARBON	NITROGEN	OXYGEN	CESIUM
3.403E-01	3.554E-01	0.E+00	0.E+00	0.E+00	6.681E-06	-2.905E-07	-5.836E-07	-2.225E-05	-8.304E-09

MOMENTUM THICKNESS, THETA (FT)	DISPLACE. THICKNESS, DELSTAR (FT)	EFFECTIVE BODY DISPLACE. (FT)	ENTHALPY THICKNESS, LAMBDA (FT)	REYNOLDS NUMBER PER FOOT	MASS THICKNESSES (FT) FOR HYDROGEN	CARBON	NITROGEN	OXYGEN	CESIUM
-4.561E-03	-1.609E-03	-1.277E-04	1.971E-03	8.626E+06	8.435E-03	7.137E-03	6.309E-03	-9.166E-03	5.840E-03

NODAL INFORMATION

DISTANCE, FROM WALL (FT)	ETA	F	FP (=U/UE)	FPP	SHEAR (LB/FTSQ)	TOTAL ENTHALPY,G (BTU/LB)	GP (BTU/LB)	GPP (BTU/LB)	STATIC ENTHALPY (BTU/LB)	TEMP (DEG R)	ELECTRON COLL FREQ (1/SEC)
0.E+00	0.E+00	-3.803E+00	0.E+00	3.674E+00	6.522E+01	-9.783E+02	6.021E+03	5.301E+04	-9.783E+02	1.500E+03	5.264E+11
1.670E-05	5.988E-02	-3.803E+00	2.067E-01	2.790E+00	6.522E+01	-5.960E+02	5.524E+03	-6.959E+04	-6.284E+02	1.865E+03	4.721E+11
3.905E-05	1.198E-01	-3.786E+00	3.227E-01	1.336E+00	6.522E+01	-3.622E+02	2.745E+03	-2.322E+04	-4.413E+02	2.306E+03	4.245E+11
7.931E-05	2.096E-01	-3.753E+00	4.867E-01	6.594E-01	6.525E+01	-1.873E+02	1.396E+03	-6.917E+03	-3.129E+02	2.648E+03	3.962E+11
1.551E-04	3.593E-01	-3.686E+00	4.772E-01	3.421E-01	6.535E+01	-3.653E+01	7.383E+02	-1.973E+03	-2.095E+02	2.935E+03	3.763E+11
2.379E-04	5.988E-01	-3.564E+00	5.383E-01	1.930E-01	6.559E+01	9.608E+01	4.205E+02	-6.401E+02	-1.240E+02	3.180E+03	3.615E+11
4.659E-04	8.983E-01	-3.385E+00	5.847E-01	1.260E-01	6.595E+01	1.974E+02	2.755E+02	-2.885E+02	-6.232E+01	3.363E+03	3.519E+11
8.409E-04	1.497E+00	-3.027E+00	6.423E-01	7.551E-02	6.681E+01	3.229E+02	1.642E+02	-8.309E+01	9.613E+00	3.587E+03	3.404E+11
1.850E-03	2.994E+00	-1.938E+00	7.232E-01	3.385E-02	6.933E+01	4.965E+02	8.153E+01	-2.742E+01	9.929E+01	3.908E+03	3.261E+11
4.011E-03	5.988E+00	3.01E-01	8.034E-01	2.055E-02	7.500E+01	6.571E+02	3.890E+01	-1.061E+00	1.669E+02	4.244E+03	3.129E+11
7.431E-03	1.048E+01	4.113E+00	8.973E-01	2.230E-02	8.197E+01	8.237E+02	3.59CE+01	-2.728E-01	2.122E+02	4.646E+03	2.991E+11
1.289E-02	1.497E+01	8.379E+00	9.986E-01	2.062E-02	8.240E+01	9.741E+02	2.923E+01	-2.701E+00	2.168E+02	4.676E+03	2.981E+11
1.945E-02	2.994E+01	2.441E+01	1.162E+00	5.119E-03	6.630E+01	1.189E+03	4.818E+00	-5.597E-01	1.642E+02	2.588E+03	4.007E+11
2.341E-02	4.791E+01	4.631E+01	1.219E+00	1.380E-03	5.302E+01	1.225E+03	1.367E+00	1.755E-01	9.698E+01	1.765E+03	4.853E+11
3.084E-02	7.485E+01	7.961E+01	1.247E+00	5.479E-04	4.455E+01	1.270E+03	0.E+00	-2.770E-01	8.894E+01	8.906E+02	6.831E+11

DISTANCE FROM WALL (FT)	DENSITY, RHO (LB/CU FT)	VISCOSITY, MU LB/SEC FT	RHO*MU /RHOE*MUE, C	SPECIFIC HEAT (BTU/LB R)	THERMAL COND (BTU /SEC FT R)	PRANDTL NUMBER	MODIFIED SCHMIDT NUMBER	MOLECULAR WEIGHT	RHOSQ*EPS /RHOE*MUE	MACH NUMBER
0.E+00	6.846E-02	2.224E-05	1.190E+00	2.978E-01	1.116E-05	5.948E-01	7.037E-01	2.879E+01	0.E+00	0.E+00
1.670E-05	6.048E-02	2.566E-05	1.010E+00	3.181E-01	1.495E-05	5.458E-01	7.032E-01	2.630E+01	5.571E-01	6.042E-01
3.905E-05	3.999E-02	2.949E-05	9.201E-01	3.327E-01	1.800E-05	5.452E-01	7.030E-01	2.577E+01	2.353E+00	8.324E-01
7.931E-05	3.456E-02	3.230E-05	8.709E-01	3.406E-01	2.014E-05	5.461E-01	7.030E-01	2.557E+01	5.703E+00	9.752E-01
1.551E-04	3.109E-02	3.456E-05	8.384E-01	3.455E-01	2.180E-05	5.479E-01	7.029E-01	2.551E+01	1.197E+01	1.086E+00
2.479E-04	2.869E-02	3.643E-05	8.155E-01	3.489E-01	2.311E-05	5.501E-01	7.029E-01	2.550E+01	2.197E+01	1.178E+00
4.650E-04	2.716E-02	3.780E-05	8.007E-01	3.510E-01	2.402E-05	5.523E-01	7.029E-01	2.552E+01	3.428E+01	1.246E+00
8.409E-04	2.553E-02	3.944E-05	7.855E-01	3.532E-01	2.503E-05	5.564E-01	7.028E-01	2.559E+01	5.853E+01	1.329E+00
1.950E-03	2.366E-02	4.173E-05	7.701E-01	3.549E-01	2.612E-05	5.671E-01	7.026E-01	2.584E+01	1.189E+02	1.446E+00
4.011E-03	2.224E-02	4.405E-05	7.642E-01	3.548E-01	2.655E-05	5.865E-01	7.023E-01	2.637E+01	2.439E+02	1.568E+00
7.431E-03	2.119E-02	4.673E-05	7.726E-01	3.514E-01	2.605E-05	6.293E-01	7.014E-01	2.751E+01	2.457E+02	1.742E+00
1.089E-02	2.209E-02	4.686E-05	9.077E-01	3.411E-01	2.401E-05	6.662E-01	6.997E-01	2.887E+01	2.671E+02	2.019E+00
1.945E-02	4.021E-02	3.158E-05	9.906E-01	2.983E-01	1.379E-05	6.832E-01	6.982E-01	2.908E+01	8.847E+02	2.995E+00
2.541E-02	5.877E-02	2.45 E-05	1.123E+00	2.810E-01	1.006E-05	6.844E-01	6.953E-01	2.898E+01	1.890E+03	3.755E+00
3.084E-02	1.160E-01	1.553E-05	1.410E+00	2.403E-01	5.472E-06	6.844E-01	6.940E-01	2.886E+01	5.450E+03	5.245E+00

DISTANCE FROM WALL,FT

0.E+00 1.670E-05 3.905E-05 7.931E-05 1.551E-04 2.879E-04 4.650E-04 8.409E-04 1.850E-03 4.011E-03
7.431E-03 1.089E-02 1.945E-02 2.541E-02 3.084E-02

ELEMENTAL FRACTIONS AND THEIR FIRST AND SECOND DERIVATIVES WITH RESPECT TO ETA

CS 3.483E-02 3.044E-02 2.897E-02 2.858E-02 2.841E-02 2.826E-02 2.809E-02 2.775E-02 2.677E-02 2.481E-02
2.076E-02 1.493E-02 4.724E-03 2.646E-03 0.E+00
-7.544E-02-5.241E-02-3.563E-03-1.904E-03-7.596E-04-5.660E-04-5.551E-04-5.927E-04-6.645E-04-6.997E-04
-1.161E-03-1.256E-03-2.760E-04-8.021E-05 0.E+00
-5.610E-01 1.330E+00 1.345E-01 1.373E-02 1.556E-03 6.122E-05 1.101E-05-1.363E-04 4.033E-05-6.383E-05
-1.415E-04 9.916E-05 3.175E-05-9.953E-06 1.591E-05

H2 1.346E-02 1.346E-02 1.468E-02 1.523E-02 1.544E-02 1.549E-02 1.545E-02 1.532E-02 1.483E-02 1.377E-02
1.156E-02 8.338E-03 2.654E-03 1.491E-03 0.E+00
-7.826E-02 3.185E-02 1.190E-02 2.774E-03 5.377E-04-1.844E-05-1.772E-04-2.745E-04-3.487E-04-3.867E-04
-6.374E-04-6.966E-04-1.545E-04-4.509E-05 0.E+00
4.166E+00-4.893E-01-1.772E-01-2.608E-02-3.797E-03-8.472E-04-2.134E-04-1.113E-04 1.205E-05-3.339E-05
-8.094E-05 5.460E-05 1.781E-05-5.625E-06 8.971E-06

CO 1.041E-01 1.241E-01 1.276E-01 1.277E-01 1.268E-01 1.248E-01 1.220E-01 1.159E-01 9.766E-02 6.351E-02
-1.619E-02-1.270E-01-3.213E-01-3.609E-01-4.114E-01
5.838E-01 1.443E-01 1.097E-02-4.423E-03-7.417E-03-8.759E-03-9.720E-03-1.095E-02-1.252E-02-1.325E-02
-2.202E-02-2.387E-02-5.263E-03-1.531E-03 0.E+00
-1.049E+01-4.154E+00-3.089E-01-3.394E-02-6.057E-03-5.142E-03-1.282E-03-2.600E-03 7.095E-04-1.202E-03
-2.704E-03 1.880E-03 6.057E-04-1.902E-04 3.039E-04

CO2 2.508E-01 2.203E-01 2.126E-01 2.113E-01 2.118E-01 2.132E-01 2.155E-01 2.204E-01 2.351E-01 2.651E-01
3.271E-01 4.166E-01 5.736E-01 6.056E-01 6.464E-01
-7.025E-01-2.939E-01-3.647E-02-9.124E-04 5.143E-03 6.871E-03 7.779E-03 8.818E-03 1.011E-02 1.071E-02
1.780E-02 1.929E-02 4.252E-03 1.237E-03 0.E+00
5.765E+00 7.879E+00 7.203E-01 7.134E-02 9.553E-03 4.878E-03 1.183E-03 2.289E-03-5.697E-04 9.707E-04
2.187E-03-1.520E-03-4.893E-14 1.537E-04-2.455E-04

N2 5.963E-01 6.117E-01 6.162E-01 6.171E-01 6.176E-01 6.182E-01 6.190E-01 6.207E-01 6.256E-01 6.358E-01
6.568E-01 6.871E-01 7.403E-01 7.511E-01 7.650E-01
2.724E-01 1.696E-01 2.215E-02 4.465E-03 2.496E-03 2.472E-03 2.674E-03 2.994E-03 3.424E-03 3.628E-03
6.025E-03 5.531E-03 1.442E-03 4.197E-04 0.E+00
1.124E+00-4.556E+00-3.688E-01-2.505E-02-1.255E-03 1.049E-03 3.011E-04 7.673E-04-1.922E-04 3.285E-04
7.389E-04-5.138E-04-1.660E-04 5.217E-05-8.333E-05

MOLE FRACTIONS

CS 1.977E-04 8.670E-04 1.792E-03 2.475E-03 2.952E-03 3.270E-03 3.450E-03 3.599E-03 3.636E-03 3.404E-03
2.679E-03 1.413E-03 9.200E-07 5.030E-10 0.E+00

H2	7.024E-02	1.242E-01	1.222E-01	1.194E-01	1.162E-01	1.128E-01	1.096E-01	1.043E-01	9.157E-02	6.869E-02
	3.031E-02	4.857E-03	4.791E-08	1.483E-12	0.E+00					
CO	7.780E-02	1.676E-01	1.847E-01	1.919E-01	1.958E-01	1.978E-01	1.981E-01	1.967E-01	1.889E-01	1.686E-01
	1.147E-01	3.150E-02	1.333E-07	1.135E-12	0.E+00					
CO2	1.540E-01	7.946E-02	5.719E-02	4.748E-02	4.231E-02	3.938E-02	3.799E-02	3.736E-02	3.917E-02	4.722E-02
	7.385E-02	1.109E-01	4.548E-02	2.541E-02	0.E+00					
N2	6.113E-01	5.742E-01	5.668E-01	5.634E-01	5.623E-01	5.626E-01	5.638E-01	5.669E-01	5.773E-01	5.984E-01
	6.444E-01	7.042E-01	7.680E-01	7.770E-01	7.881E-01					
E-	0.E+00	2.847E-11	3.296E-09	4.345E-08	2.383E-07	7.940E-07	1.736E-06	4.052E-06	1.136E-05	2.739E-05
	6.148E-05	4.729E-05	2.313E-10	0.E+00	0.E+00					
C	2.771E-37	1.236E-29	4.171E-24	4.252E-21	4.133E-19	1.047E-17	8.463E-17	7.945E-16	1.104E-14	8.414E-14
	2.955E-13	1.752E-14	7.532E-34	4.900E-53	0.E+00					
K	1.795E-12	1.239E-09	1.755E-07	2.621E-06	1.568E-05	5.564E-05	1.266E-04	3.076E-04	8.897E-04	2.089E-03
	3.804E-03	1.631E-03	1.084E-09	9.937E-16	0.E+00					
O	1.802E-26	1.576E-20	1.518E-15	7.876E-13	4.974E-11	9.509E-10	6.597E-09	5.586E-08	8.594E-07	1.196E-05
	2.875E-04	1.840E-03	3.939E-07	2.200E-11	1.723E-24					
N	1.535E-27	1.014E-21	4.077E-17	1.321E-14	6.088E-13	9.228E-12	5.440E-11	3.760E-10	4.106E-09	3.433E-08
	2.982E-07	3.595E-07	6.230E-15	5.162E-23	7.840E-48					
C3	6.683E-39	1.275E-32	3.412E-29	2.461E-27	4.075E-26	2.866E-25	9.721E-25	3.305E-24	1.014E-23	1.230E-23
	1.171E-24	1.628E-28	1.815E-64	6.048E-99	0.E+00					
CH4	3.948E-02	7.054E-04	3.551E-06	1.919E-07	2.702E-08	6.539E-09	2.509E-09	8.255E-10	1.613E-10	2.018E-11
	3.953E-13	4.742E-16	2.539E-32	8.016E-47	0.E+00					
CN	9.848E-24	2.587E-19	2.486E-16	1.035E-14	1.210E-13	6.824E-13	2.073E-12	6.714E-12	2.525E-11	6.129E-11
	6.920E-11	3.965E-12	3.533E-27	6.701E-42	0.E+00					
CH	2.627E-32	4.683E-26	9.695E-22	2.131E-19	7.433E-18	9.043E-17	4.509E-16	2.476E-15	1.715E-14	6.463E-14
	8.569E-14	1.958E-15	3.036E-35	1.454E-54	0.E+00					
CHN	3.125E-07	1.096E-06	7.418E-07	5.965E-07	5.121E-07	4.535E-07	4.112E-07	3.549E-07	2.536E-07	1.307E-07
	2.387E-08	4.981E-10	2.387E-22	8.357E-34	0.E+00					
CHO	1.657E-10	6.995E-09	6.339E-08	2.058E-07	4.434E-07	7.570E-07	1.063E-06	1.511E-06	2.182E-06	2.560E-06
	1.766E-06	1.997E-07	7.560E-17	8.763E-26	0.E+00					
C2	3.895E-42	3.452E-34	6.121E-29	4.333E-26	3.268E-24	6.809E-23	4.762E-22	3.632E-21	3.535E-20	1.446E-19
	1.226E-19	3.600E-22	4.263E-51	2.798E-79	0.E+00					
C2H2	5.897E-12	2.983E-11	6.502E-12	2.791E-12	1.562E-12	1.004E-12	7.231E-13	4.647E-13	1.953E-13	4.269E-14
	1.126E-15	4.439E-19	3.499E-43	1.601E-65	0.E+00					
CS2	1.953E-08	1.062E-07	1.588E-07	1.713E-07	1.668E-07	1.565E-07	1.462E-07	1.314E-07	1.059E-07	7.518E-08
	3.758E-08	1.031E-08	2.586E-14	4.870E-20	0.E+00					
CSOH	7.334E-03	5.155E-03	3.826E-03	3.024E-03	2.499E-03	2.149E-03	1.940E-03	1.740E-03	1.557E-03	1.491E-03
	1.558E-03	1.782E-03	1.033E-03	5.769E-04	0.E+00					
HNO2 CIS	1.344E-28	9.376E-24	1.952E-19	4.376E-17	1.592E-15	2.075E-14	1.134E-13	7.555E-13	9.302E-12	1.227E-10
	3.710E-09	5.350E-08	2.453E-08	3.395E-09	0.E+00					
HNO2 TRA	1.812E-28	1.139E-23	2.395E-19	5.249E-17	1.881E-15	2.426E-14	1.316E-13	8.699E-13	1.061E-11	1.367E-10
	4.156E-09	5.991E-08	2.953E-08	4.395E-09	0.E+00					
HO	5.166E-16	1.433E-12	1.141E-09	4.267E-08	4.675E-07	2.562E-06	7.822E-06	2.682E-05	1.306E-04	6.013E-04
	3.636E-03	8.727E-03	2.038E-05	2.827E-08	0.E+00					
H2O	4.071E-02	4.736E-02	6.347E-02	7.231E-02	7.793E-02	8.200E-02	8.499E-02	8.908E-02	9.714E-02	1.094E-01
	1.230E-01	1.085E-01	3.775E-02	2.114E-02	0.E+00					
NO	6.363E-19	5.548E-15	1.414E-11	1.009E-09	1.711E-08	1.287E-07	4.863E-07	2.126E-06	1.455E-05	9.984E-05
	1.197E-03	7.627E-03	8.039E-04	2.619E-05	5.282E-10					
O2	6.565E-27	3.264E-21	3.887E-16	2.241E-13	1.521E-11	3.087E-10	2.253E-09	2.071E-08	3.886E-07	8.801E-06
	4.816E-04	1.695E-02	1.469E-01	1.758E-01	2.119E-01					
CS+1	0.E+00	2.847E-11	3.296E-09	4.345E-08	2.383E-07	7.940E-07	1.736E-06	4.052E-06	1.136E-05	2.739E-05
	6.150E-05	4.781E-05	1.417E-09	0.E+00	0.E+00					
C+	0.E+00	8.161E-73	1.113E-58	5.831E-51	7.665E-46	3.290E-42	7.590E-40	2.778E-37	3.630E-34	1.601E-31
	3.706E-29	3.996E-30	2.360E-62	0.E+00	0.E+00					
H+1	0.E+00	1.277E-64	1.264E-51	1.601E-44	8.281E-40	1.849E-36	2.839E-34	6.830E-32	5.865E-29	2.200E-26
	7.360E-24	6.141E-24	9.753E-47	0.E+00	0.E+00					
N+	0.E+00	2.147E-80	4.304E-64	3.384E-55	2.690E-49	4.178E-45	2.280E-42	2.202E-39	1.090E-35	2.115E-32
	4.909E-29	1.182E-28	1.994E-54	0.E+00	0.E+00					
O2-	0.E+00	5.893E-29	1.165E-22	2.328E-19	4.769E-17	1.802E-15	1.951E-14	2.712E-13	8.240E-12	2.480E-10
	1.988E-03	5.193E-07	1.186E-09	0.E+00	0.E+00					

CO+	0.E+00	1.581E-57	2.500E-46	3.259E-40	3.720E-36	2.837E-33	2.158E-31	2.415E-29	8.073E-27	1.325E-24
	1.906E-22	1.029E-22	3.136E-45	0.E+00	0.E+00					
NO+	0.E+00	6.555E-49	9.347E-39	3.292E-33	1.595E-29	6.717E-27	3.533E-25	2.746E-23	6.706E-21	1.132E-18
	3.773E-16	4.125E-15	8.657E-26	0.E+00	0.E+00					
O+	0.E+00	3.206E-75	1.693E-59	6.726E-51	3.465E-45	4.017E-41	1.837E-38	1.505E-35	6.689E-32	1.453E-28
	6.266E-25	7.801E-24	5.029E-44	0.E+00	0.E+00					

2. CHECK CASE 2 - CONVENTIONAL REENTRY VEHICLE ANALYSIS

a. Vehicle Configuration

1) Geometry: Sphere-cone

a) Nose Radius: 1/2-inch

b) Cone half angle: 8 degrees

c) Length (streamwise): 7.0922 feet

2) Heatshield

a) ATJ graphite from nose tip to .864 feet streamwise distance

b) Phenolic carbon (composition as specified in NASA CR-72301, Aerotherm Report No. 67-15) between streamwise distances of .865 feet and 7.0922 feet

c) Contamination: 100 PPM by weight sodium Na in graphite and phenolic carbon

b. Wall Boundary Conditions

1) Mass Ablation Rate: See Case II input cards

2) Wall Temperature: See Case II input cards

c. Free Stream Properties

1) Altitude: 10,000 feet

2) Velocity: 14,000 feet/second

3) Density: .05648 lb/ft^3

4) Enthalpy: 115.364 Btu/lb (ref. to 0°K)
(static, -12.832 Btu/lb, ref. to 298°K)

5) Pressure: .6880 atm

6) Mach No.: 12.994

d. Shock Data

1) Local Pressure Ratio: See Case II input cards

2) Stagnation Conditions (from inviscid flow solution):

a) Pressure: 149.91 atm

b) Enthalpy: 3903.3 Btu/lb (ref. to 298°K)

3) Freestream stream function position vs. shock angle: See Case II input cards

e. Input Cards

```
102030202102O2      CHECK CASE 2 - REENTRY VEHICLE
blank card
 5          1111111111111111111112222222222222222
 1
 1.
39
0.          .004       .008       .013       .017       .025       .035       .045
.055        .059632    .063       .068       .075       .086       .098       .120
.150        .21        .31        .4417      .60        -.864      -.865      1.0
1.2857      1.50       1.7065     2.1272     2.548      2.9687     3.3895     3.8103
4.231       5.0725     5.9141     6.75       6.80       6.9239     7.0922
15
0.          .002       .004       .007       .012       .020       .030       .050
.10         .2         .35        .5         1.0        1.6        2.5
13 .95
8.0         .04166667
-.04166667
            .04126

2 blank cards
                                                                              1.02
149.91
3903.3
.
0.44        11.823     .018       .9         .9         300.
1000.
  6
  1HYDROGEN     1.008                                        -.0209+6
  6 CARBON      12.011                      -1.    +6        -.9236+6
  7NITROGEN     14.008     -.765
  8 OXYGEN      16.000     -.235                             -.0554+6
 11 SODIUM      22.991                      -1.               -1.
 99ELECTRON     0.00055
  1001                                        JANAF 12/60                          H
521020+5 124230+5 480223+1 555469-4 173095+6 388620+2  500. 3000.1    0.H
521020+5 124230+5 308752+1 315025-3 929744+7 388620+2 3000. 5000.1    0.H
  1006                                        JANAF 03/61                          C
170886+6 125500+5 444433+1 228125-3 409830+6 492870+2  500. 3000.1    0.C
170886+6 125500+5 412212+1 261908-3 262886+7 492870+2 3000. 5000.1    0.C
  1 11  0   0  0  0  0                      JANAF  06/62       AFWL - WRS  NA
257350+5 124670+5 481002+1 916143-4 372315+5 482000+2   500  30001      NA
257350+5 124670+5-122836+2 344219-2 634141+8 482000+2  3000  60001      NA
  2008                                        JANAF 03/61                          O2
      -  234460+5 804370+1 510872-3-152718+6 679730+2  500. 3000.1    0.O2
      -  234460+5 103071+2 290991-4-783079+7 679730+2 3000. 5000.1    0.O2
  2007                                        JANAF 03/61                          N2
      -  221650+5 862699+1 116090-3-103715+7 637650+2  500. 3000.1    0.N2
      -  221650+5 984175+1-116232-3-612728+7 637650+2 3000. 5000.1    0.N2
01001 01 06                                   JANAF 03/61                          CH
142006+6 221300+5 826079+1 302211-3-100184+7 616120+2  500. 3000.1    0.CH
142006+6 221300+5 707091+1 463291-3 552860+7 616120+2 3000. 5000.1    0.CH
  1001 01 06 01 07                            JANAF 03/61                          CHN
312000+5 355930+5 137023+2 552243-3-228955+7 758620+2  500. 3000.1    0.CHN
312000+5 355930+5 173895+2-295052-3-183671+8 758620+2 3000. 5000.1    0.CHN
  1001 01 06 01 07 01 08                      JANAF 12/60                          CHNO
```

```
-279000+5 461930+5 179701+2 469024-3-200904+7 928990+2  500. 3000.1   0.CHNO
-279000+5 461930+5 210167+2-229915-3-105568+8 928990+2 3000. 5000.1   0.CHNO
  1001 01 06 01 08                          JANAF 03/61                  CHO
-290600+4 323670+5 128033+2 300638-3-201721+7 789830+2  500. 3000.1   0.CHO
-290600+4 323670+5 163528+2 633312-3 121615+8 789830+2 3000. 5000.1   0.CHO
  2001 01 06                                JANAF 12/62                  CH2
 950000+5 329960+5 132894+2 413822-3-290273+7 684940+2  500. 3000.1   0.CH2
 950000+5 329960+5 140728+2 132150-3-239493+7 684940+2 3000. 5000.1   0.CH2
  2001 01 06 01 08                          JANAF 03/61                  CH2O
-277000+5 437910+5 184022+2 379921-3-431982+7 848830+2  500. 3000.1   0.CH2O
-277000+5 437910+5 199628+2 161963-3-372770+7 848880+2 3000. 5000.1   0.CH2O
  4001 01 06                                JANAF 03/61                  CH4
-176950+5 530790+5 230948+2 677896-3-755061+7 825970+2  500. 3000.1   0.CH4
-176950+5 530790+5 236033+2 374223-3-368234+7 825970+2 3000. 5000.1   0.CH4
  1006 01 07                                JANAF 12/62                  CN
 109000+6 272490+5 555906+1 115326-2 479517+6 669760+2  500. 3000.1   0.CN
 109000+6 272490+5 988013+1 313855-3-649453+7 669760+2 3000. 5000.1   0.CN
  1  6  1  7  1 11  0  0  0  0  0  *  0 0JANAF  03/66       AFWL - WRS   CNNA
 225300+5 380100+5 138804+2 331050-3-381026+6 894600+2   500  30001     CNNA
 225300+5 380100+5 143691+2 778244-4 167248+7 894600+2  3000  50001     CNNA
  1006 01 08                                JANAF 03/61                  CO
-264170+5 223570+5 866040+1 117021-3-898211+6 653700+2  500. 3000.1   0.CO
-264170+5 223570+5 115496+2-424139-3-131563+8 653700+2 3000. 5000.1   0.CO
  1006 02 08                                JANAF 03/61                  CO2
-940540+5 365350+5 144559+2 210386-3-182392+7 798480+2  500. 3000.1   0.CO2
-940540+5 365350+5 156451+2-381561-4-602768+7 798480+2 3000. 5000.1   0.CO2
602006                                      JANAF 9/61                   C2
 198999+6 246990+5 776612+1 696081-3 185649+6 685519+2  500. 3000.1   0.C2
 198999+6 246990+5 104162+2 566841-4-640205+7 685519+2 3000. 5000.1   0.C2
  10 1  2  6                                DUFF BAUER 6/61              C2H
 117395+6 349620+5 134210+2 469100-3-187509+7 781140+2  500. 3000.1   0.C2H
 117395+6 349620+5 149516+2 109402-3-503862+7 781140+2 3000. 5000.1   0.C2H
  2001 02 06                                JANAF 03/61                  C2H2
 541900+5 482570+5 189960+2 769044-3-409039+7 849690+2  500. 3000.1   0.C2H2
 541900+5 482570+5 209952+2 289062-3-645297+7 849690+2 3000. 5000.1   0.C2H2
  4001 02 06                                JANAF 12/60                  C2H4
 124960+5 676830+5 294887+2 526569-3-865213+7 101790+3  500. 3000.1   0.C2H4
 124960+5 676830+5 313872+2 616238-4-1310598+8 101790+3 3000. 5000.1   0.C2H4
 602006 07                                  JANAF 3/61                   C2N2
 738699+5 511070+5 108740+2 559856-3-896873+6 985470+2  500. 3000.1   0.C2N2
 738699+5 511070+5 208204+2 630229-5-346985+7 985470+2 3000. 5000.1   0.C2N2
  3006                                      JANAF 12/60                  C3
 189670+6 366220+5 146441+2 622536-4-168227+7 798410+2  500. 3000.1   0.C3
 189670+6 366220+5 144782+2 792232-4-646877+6 798410+2 3000. 5000.1   0.C3
  1001 01 07                                JANAF 12/60                  HN
 792000+5 217660+5 821133+1 281555-3-126895+7 609290+2  500. 3000.1   0.HN
 792000+5 217660+5 766457+1 359353-3 180777+7 609290+2 3000. 5000.1   0.HN
  1  1  1 11  0  0  0  0  0  0  *          JANAF  03/63       AFWL - WRS   HNN
 297000+5 242590+5 874435+1 298029-3-260114+6 648020+2   500  30001     HNN
 297000+5 242590+5 949472+1 225812-3 234538+7 648020+2  3000  50001     HNN
  1  1  1  9  1 11  0  0  0  0  0  *  0 0JANAF  03/66       AFWL - WRS   HNNO
-504000+5 391100+5 114447+2 722585-3-402755+6 830870+2   500  30001     HNNO
-504000+5 391100+5 127721+2 169600-3 257073+7 830870+2  3000  50001     HNNO
  1001 01 07 01 08                          JANAF 12/60                  HNO
 238000+5 327550+5 131320+2 122061-3-232403+7 798850+2  500. 3000.1   0.HNO
 238000+5 327550+5 141522+2-470474-4-469135+7 798850+2 3000. 5000.1   0.HNO
```

```
  1001 01 08                                        JANAF 12/60                    HO
 933000+4 214040+5 773193+1 394386-3-973561+6 613920+2  500. 3000.1   0.HO
 933000+4 214040+5 965144+1-443528-4-686115+7 613820+2 3000. 5000.1   0.HO
  2001                                              JANAF 03/61                    H2
       -  212100+5 711963+1 621950-3-71269+6 484650+2  500. 3000.1   0.H2
       -  212100+5 681794+1 585854-3 265106+7 484650+2 3000. 5000.1   0.H2
0020010010 07                                       JANAF 12/65                    H2N
 400999+5 30579+5 975862+1 114401-2-518970+6 701550+2  500. 3000.1   0.H2N
 400999+5 30579+5 137419+2 229493-4-610324+7 7 1580+2 3000. 5000.1   0.H2N
  2  1  2  7  0  0  0  0  0  *                T666 LIBRARY                   H2N2
 509000+5 437709+5 173547+2 582286-3-325379+7 851033+2   500  30001        H2N2
 509000+5 437709+5 186269+2 195007-3-154736+7 851033+2  3000  50001        H2N2
  2001 01 08                                        JANAF 03/61                    H2O
-577980+5 302010+5 112254+2 811397-3-260900+7 684210+2  500. 3000.1   0.H2O
-577980+3 30201O+5 157278+2-191548-3-173599+8 694210+2 3000. 5000.1   0.H2O
0030010010 07                                       JANAF 09/65                    H3N
-109700+5 41630O+5 125186+2 219670-2-978631+6 769080+2  500. 3000.1   0.H3N
-109700+5 41630O+5 166320+2 923148-3-361337+7 769080+2 2000. 5000.1   0.H3N
0040010020 07                                       JANAF 12/65                    H4N2
 227899+5 685359+5 229856+2 241933-2-195931+7 108099+3  500. 3000.1   0.H4N2
 227899+5 685359+5 314319+2 407945-4-139705+8 108099+3 3000. 5000.1   0.H4N2
  1  8  1 11  0  0  0  0  0                   JANAF  12/60        AFWL - WRS      NAO
 132000+5 243470+5 891391+1 138113-3-123218+6 743820+2   500  30001        NAO
 132000+5 243470+5 873051+1 159255-3 116133+7 743820+2  3000  50001        NAO
  2 11  0  0  0  0  0                          JANAF  06/62        AFWL - WRS      NA2
 549980+5 258510+5 894240+1 385123-3-845826+4 766340+2   500  30001        NA2
 549980+5 258510+5 840237+1 464003-3 334031+7 766340+2  3000  50001        NA2
  1007                                              JANAF 03/61                    N
 112965+6 134370+5 486944+1 383516-4 958460+5 480900+2  500. 3000.1   0.N
 112965+6 134370+5 428957+1 240844-3-417273+6 480900+2 3000. 5000.1   0.N
  1007 01 08                                        JANAF 06/63                    NO
 215800+5 227000+5 877623+1 899031-4-789656+6 698490+2  500. 3000.1   0.NO
 215800+5 227000+5 916260+1 657885-5-212519+7 698490+2 3000. 5000.1   0.NO
  1007 02 08                                        JANAF 06/63                    NO2
 801100+4 345800+5 137819+2 315611-4-133765+7 848890+2  500. 3000.1   0.NO2
 801100+4 345800+5 130154+2 172586-3 175340+7 848890+2 3000. 5000.1   0.NO2
0010070030 08                                       JANAF 12/64                    NO3
 170000+5 498219+5 192301+2 191161-3-112129+7 998970+2  500. 3000.1   0.NO3
 170000+5 498219+5 198709+2 577142-7-172913+7 998970+2 3000. 5000.1   0.NO3
  2007 01 08                                        JANAF 12/60                    N2O
 195000+5 365450+5 144686+2 120489-3-153479+7 815900+2  500. 3000.1   0.N2O
 195000+5 365450+5 123036+2 459018-3 942382+7 815900+2 3000. 5000.1   0.N2O
0020070030 08                                       JANAF 12/64                    N2O3
 197999+5 617799+5 232121+2 477580-3-124103+7 123217+3  500. 3000.1   0.N2O3
 197999+5 61779O+5 248304+2 102872-5-293892+7 123217+3 3000. 5000.1   0.N2O3
0020070040 08                                       JANAF 9/64                     N2O4
 216999+4 785969+5 297734+2 594431-3-178833+7 134908+3  500. 3000.1   0.N2O4
 216999+4 785969+5 317815+2 175630-5-385969+7 134908+3 3000. 5000.1   0.N2O4
0020070050 08                                       JANAF 12/64                    N2O5
 216999+4 915759+5 353051+2 147295-3-163850+7 156719+3  500. 3000.1   0.N2O5
 216999+4 915759+5 357365+2 624548-5-171267+7 156719+3 3000. 5000.1   0.N2O5
  1008                                              JANAF 06/62                    O
 595590+5 135220+5 497228+1 380768-5 154749+5 500960+2  500. 3000.1   0.O
 595590+5 135220+5 657489+1-224268-3-891782+7 500960+2 3000. 5000.1   0.O
  1 99                                              JANAF   05/65     AFWL - JEF     O-
 0        134230+5 496800+1 215333-5 262860-6 164590+2   300  30001        O-
```

```
 0          134230+5 496800+1-232368-6-986224-6 164590+2  3000  50001      E-
  1  6 -1 99  0  0  0  0  0  0              AFWL TDR 64-44 NORM TO 298 JEFC+1
 432426+6 134352+5 496355+1-130999-6 339973+4 484319+2   500  30001    C+1
 432426+6 134352+5 495164+1 323814-5 646115+5 484318+2  3000  50001    C+1
 01 11 -1 99                                                           NA+
+14383 +6+134231+5+49681 +1                  +468068+2 00500 060001      NA+
+14383 +6+134231+5+49681 +1                  +468068+2 00500 060001      NA+
  1  7  1  8 -1 99                          JANAF  06/66       AFWL - WRS  NO+
 236660+6 221500+5 774529+1 418339-3-269762+6 653320+2   500  30001      NO+
 236660+6 221500+5 829583+1 130026-3 219401+7 653320+2  3000  50001      NO+
  1  8  1 99                               JANAF  06/66       AFWL - WRS  O-
 243000+5 134820+5 496695+1 691566-6 198781+5 492850+2   500  30001      O-
 243000+5 134820+5 496947+1-180033-6 138583+5 492850+2  3000  50001      O-
  1  6  1 99  0 -0  0 -0  0 --   -     - JANAF   09-65      AFWL-NV      C-
 140500+6 134370+5 491212+1 321368-4 132546+5 476310+2   500  30001      C-
 140500+6 134370+5 244233+1 573167-3 763348+7 476310+2  3000  60001      C-
  1  1 -1 99  0 -0  0 -0  0 -0  * -     - AFWL TDR 64-44 NORM TO 298 JEFH+1
 367161+6 134226+5 496793+1-596238-5-304069-6 374820+2   500  30001      H+1
 367161+6 134226+5 496793+1-267224-5-113416-4 374820+2  3000  50001      H+1
  1  1  1  8  1 99  0 -0  0 -0  0 -0  0 -CJANAF   3-66       AFWL-NV      HO-1
-344000+5 213240+5 674082+1 719851-3-638922+5 585520+2   500  30001      HO-1
-344000+5 213240+5 781605+1 250452-3 287562+7 585520+2  3000  50001      HO-1
  3  1  1  8 -1 99  0  0  0  0  0  0  0  0 CJANAF  06/66       AFWL - WRS  H3O+1
 138900+6 402930+5 118547+2 235311-2-918440+6 759010+2   500  30001      H3O+1
 138900+6 402930+5 169099+2 505835-3 773056+7 759010+2  3000  60001      H3O+1
  1  7 -1 99  0  0  0  0  0  0  *          AFWL TDR 64-44 NORM TO 298 JEFN+1
 449589+6 134721+5 489332+1 338126-4 563287+5 497019+2   500  30001      N+1
 449589+6 134721+5 451805+1 137668-3 629698+6 497019+2  3000  50001      N+1
  1  7  2  8  1 99  0 -0  0 -0  0 -0  0 -0  0 -OJANAF   12-65       AFWL-NV      NO2-
-859000+5 350150+5 133480+2 190394-3-71000+6 845930+2   500  30001      NO2-
-859000+5 350150+5 135346+2 548795-4 105301+7 845930+2  3000  60001      NO2-
  2  7 -1 99  0 -0  0 -0  0 -0  -     - BROWNE  EPT'1-3 SWAG AFWL-NV    N2+1
 359306+6 252240+5 609358+1 103235-2-983877+5 656860+2   500  30001      N2+1
 359306+6 252240+5 106418+2 903548-4-51873+7 656860+2  3000  50001      N2+1
  1  8 -1 99  0  0  0  0  0  0  *          AFWL TDR 64-44 NORM TO 298 JEFO+1
 375070+6 134238+5 496452+1 154756-5 240532+4 484812+2   500  30001      O+1
 375070+6 134238+5 426730+1 146410-3 236616+7 484812+2  3000  50001      O+1
  2  8 -1 99                               BROWNE  EPT'1-3     AFWL-NV      O2+1
 231480+6 227199+5 821253+1 295407-3-317005+6 677520+2   500  30001      O2+1
 231480+6 227199+5 759256+1 307052-3 439516+7 677520+2  3000  50001      O2+1
  2  8  1 99                               JANAF  12/66       AFWL - WRS  O2-
-113900+5 235850+5 874295+1 147731-3-260657+6 693050+2   500  30001  15 O2-
-113900+5 235850+5 849680+1 160340-3 168458+7 693050+2  3000  60001  15 O2-
blank card
13 14000.  .03648     -12.832    .6880
F 0.       .019571    .039142    .059170    .08009     .10147     .12165     .13936
.17072     .20123     .24552     .30143     .35947     .49975     .60781     .80221
.99494     1.4552
R 0.       .9563      .6931      .9471      1.1397     1.2418     1.3012     1.3370
1.3768     1.3933     1.4109     1.4249     1.4323     1.4166     1.4069     1.4011
1.4009     1.4011
blank card
1.00       .9891      .95837     .88795     .81501     .63932     .46627     .31019
.220156    .165578    .063815    .061907    .059205    .055102    .050221    .044704
.038409    .034425    .029982    .030536    .019076    .019064    .019045    .019011
.021154    .022592    .023870    .026026    .027384    .027964    .027991    .027844
```

.027654 .027659 .027633 .027647 .027649 .027652 .027656

7 blank cards

7986.	7999.	7974.	7956.	7913.	7798.	7766.	7552.
7251.	7083.	7055.	7028.	6995.	6956.	6919.	6836.
6748.	6595.	6362.	6255.	6176.	6155.	5994.	5956.
5990.	6031.	6066.	6106.	6085.	6102.	6109.	6071.
6076.	6083.	6089.	6040.	6041.	6043.	6046.	

11 blank cards

.4759	.5058	.4733	.4896	.4399	.3586	.8041	.6501
.2908	.1919	.1789	.1711	.1621	.1519	.1420	.1245
.1085	.08643	.06598	.05764	.05383	.05393	.06729	.07112
.07794	.08571	.09429	.1110	.1161	.1218	.1226	.1157
.1160	.1157	.1148	.1071	.1074	.1078	.1032	

blank card

;

(end-of-file card)

f. Computer Output

The first and last points of the boundary layer edge and shock thermodynamic state output are presented. The boundary layer solutions for the stagnation point and for one station on the afterbody are also included.

BOUNDARY LAYER INTEGRAL MATRIX PROGRAM (BLIMP)

AEROTHERM CORPORATION,PALO ALTO,CALIF (RMK,EPB)

CASE CHECK CASE 2 - REENTRY VEHICLE

CONTROL NUMBERS 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

1 0 2 0 3 0 2 0 2 1 0 2 0 2 -0 -0 -0 -0 -0 -0

PUNCH CONTROL
IDENT JSPEC
-0

U/UE TO NORM. ETA	NODAL PT. AT WHICH ETA NORM.	ETA VALUES
9.500E-01	13	0.E+00 2.000E-03 4.000E-03 7.000E-03 1.200E-02 2.000E-02 3.000E-02 5.000E-02 1.000E-01
		2.000E-01 3.500E-01 5.000E-01 1.000E+00 1.600E+00 2.500E+00

NOSE RADIUS,FT 4.16667E-02 CONE HALF ANGLE 8.00000E+00 DEGREES

CASE 2.00000E+00

TOTAL ENTHALPY,BTU/LB 3.90330E+03

TOTAL PRESSURE,ATM 1.49910E+02

INCIDENT RAD FLUX,B/SF2 0.E+00

MIXING LENGTH CONSTANT = 4.4000E-01
SUBLAYER CONSTANT, YA+ = 1.1823E+01
CLAUSER NUMBER = 1.8000E-02
TURBULENT SCHMIDT NUMBER= 9.0000E-01
TURBULENT PRANDTL NUMBER= 9.0000E-01
TRANSITION MOM.THICK.RE = 3.0000E+02

CASE 2 -

RELATIVE ELEMENTAL COMPOSITIONS, ATOMIC WTS/UNIT MASS

AT.NO.	ELEMENT	ATOMIC WT	EDGE GAS	PYRO.GAS 1	CHAR 1	PYRO.GAS 2	CHAR 2	PYRO.GAS 3	CHAR 3
1	HYDROGEN	1.00800	0.0000000	-0.0000000	0.0000000	-0.0000000	00.0207362	-0.0000000	-0.0000000
6	CARBON	12.01100	0.0000000	-0.0000000	00.0832559	-0.0000000	00.0769038	-0.0000000	-0.0000000
7	NITROGEN	14.00800	00.0546117	-0.0000000	0.0000000	-0.0000000	0.0000000	-0.0000000	-0.0000000
8	OXYGEN	16.00000	00.0146875	-0.0000000	0.0000000	-0.0000000	00.0034620	-0.0000000	-0.0000000
11	SODIUM	22.99100	0.0000000	-0.0000000	00.0000000	-0.0000000	00.0000000	-0.0000000	-0.0000000
99	ELECTRON	00.00055	0.0000000	-0.0000000	0.0000000	-0.0000000	0.0000000	-0.0000000	-0.0000000

THERMODYNAMIC PROPERTY CURVE-FIT DATA (SEE MANUAL FOR FORMAT)

```
1.  1-0. -0-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 12/60                    H
 0.52102E+05 0.13423E+05 0.48022E+01 0.55547E-04 0.17310E+06 0.38862E+02  500.0000  3000.0000 1
 0.52102E+05 0.13423E+05 0.30875E+01 0.31503E-03 0.92974E+07 0.38862E+02 3000.0000  5000.0000 1
1.  6-0. -0-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 03/61                    C
 0.17089E+06 0.13550E+05 0.44443E+01 0.22813E-03 0.40983E+06 0.49287E+02  500.0000  3000.0000 1
 0.17089E+06 0.13550E+05 0.41221E+01 0.26191E-03 0.26289E+07 0.49287E+02 3000.0000  5000.0000 1
1. 11 0.  0 0.  0 0.  0 0.  0 0.  0 0.  0JANAF  06/62       AFWL - WRS  NA
 0.25735E+05 0.13467E+05 0.48100E+01 0.31614E-04 0.37231E+05 0.48200E+02  500.0000  3000.0000 1
 0.25735E+05 0.13467E+05-0.12284E+02 0.34422E-02 0.63414E+08 0.48200E+02 3000.0000  6000.0000 1
2.  8-0. -0-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 03/61                    O2
 0.E+00      0.23446E+05 0.80437E+01 0.51087E-03-0.15272E+06 0.67973E+02  500.0000  3000.0000 1
 0.E+00      0.23446E+05 0.10307E+02 0.29099E-04-0.78308E+07 0.67973E+02 3000.0000  5000.0000 1
2.  7-0. -0-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 03/61                    N2
 0.E+00      0.22165E+05 0.86270E+01 0.11609E-03-0.10371E+07 0.63765E+02  500.0000  3000.0000 1
 0.E+00      0.22165E+05 0.98417E+01-0.11623E-03-0.61273E+07 0.63765E+02 3000.0000  5000.0000 1
1.  1 1.  6-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 03/61                    CH
 0.14201E+06 0.22130E+05 0.82608E+01 0.30221E-03-0.10018E+07 0.61612E+02  500.0000  3000.0000 1
 0.14201E+06 0.22130E+05 0.70709E+01 0.46328E-03 0.55286E+07 0.61612E+02 3000.0000  5000.0000 1
1.  1 1.  6 1.  7-0. -0-0. -0-0. -0-0. -0JANAF 03/61                    CHN
 0.31200E+05 0.35593E+05 0.13702E+02 0.55224E-03-0.22935E+07 0.75862E+02  500.0000  3000.0000 1
 0.31200E+05 0.35593E+05 0.17889E+02-0.29505E-03-0.18367E+08 0.75862E+02 3000.0000  5000.0000 1
1.  1 1.  6 1.  7 1.  8-0. -0-0. -0-0. -0JANAF 12/60                    CHNO
-0.27900E+05 0.46193E+05 0.17970E+02 0.46902E-03-0.20090E+07 0.92899E+02  500.0000  3000.0000 1
-0.27900E+05 0.46193E+05 0.21017E+02-0.22991E-03-0.10557E+08 0.92899E+02 3000.0000  5000.0000 1
1.  1 1.  6 1.  8-0. -0-0. -0-0. -0-0. -0JANAF 03/61                    CHO
-0.29000E+04 0.32367E+05 0.12803E+02 0.30064E-03-0.20172E+07 0.78983E+02  500.0000  3000.0000 1
-0.29000E+04 0.32367E+05 0.10303E+02 0.63331E-03 0.12161E+08 0.78983E+02 3000.0000  5000.0000 1
2.  1 1.  6-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 12/62                    CH2
 0.95800E+05 0.32996E+05 0.13289E+02 0.41382E-03-0.29027E+07 0.68494E+02  500.0000  3000.0000 1
 0.95800E+05 0.32996E+05 0.14073E+02 0.13215E-03-0.23949E+07 0.68494E+02 3000.0000  5000.0000 1
2.  1 1.  6 1.  8-0. -0-0. -0-0. -0-0. -0JANAF 03/61                    CH2O
-0.27700E+05 0.43791E+05 0.18402E+02 0.37992E-03-0.43198E+07 0.84888E+02  500.0000  3000.0000 1
-0.27700E+05 0.43791E+05 0.18963E+02 0.16196E-03-0.37277E+07 0.84888E+02 3000.0000  5000.0000 1
4.  1 1.  6-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 03/61                    CH4
-0.17895E+05 0.53079E+05 0.23395E+02 0.67790E-03-0.75506E+07 0.82597E+02  500.0000  3000.0000 1
-0.17895E+05 0.53079E+05 0.23605E+02 0.37432E-03-0.36823E+07 0.82597E+02 3000.0000  5000.0000 1
1.  6 1.  7-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 12/62                    CN
 0.10900E+06 0.23249E+05 0.65591E+01 0.11533E-02 0.47952E+06 0.66976E+02  500.0000  3000.0000 1
 0.10900E+06 0.23249E+05 0.98801E+01 0.31386E-03-0.64945E+07 0.66976E+02 3000.0000  5000.0000 1
1.  6 1.  7 1. 11 0.  0 0.  0 0.  0 0.  0JANAF  03/66       AFWL - WRS  CNNA
 0.22530E+05 0.38010E+05 0.13880E+02 0.33105E-03-0.38103E+06 0.89460E+02  500.0000  3000.0000 1
 0.22530E+05 0.38010E+05 0.14369E+02 0.77824E-04 0.16725E+07 0.89460E+02 3000.0000  5000.0000 1
1.  6 1.  8-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 03/61                    CO
-0.26417E+05 0.22357E+05 0.96504E+01 0.11702E-03-0.89821E+06 0.65370E+02  500.0000  3000.0000 1
-0.26417E+05 0.22357E+05 0.11550E+02-0.42414E-03-0.13156E+08 0.65370E+02 3000.0000  5000.0000 1
```

```
1.  6 2.  8-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 03/61                    CO2
-0.94054E+05 0.36535E+05 0.14456E+02 0.21039E-03-0.18239E+07 0.79848E+02  500.0000  3000.0000 1
-0.94054E+05 0.36535E+05 0.13645E+02-0.38156E-04-0.60277E+07 0.79848E+02 3000.0000  5000.0000 1
2.  6-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 9/61                           C2
 0.19900E+06 0.24699E+05 0.77561E+01 0.69608E-03 0.18565E+06 0.68552E+02  500.0000  3000.0000 1
 0.19900E+06 0.24699E+05 0.10416E+02 0.56684E-04-0.64020E+07 0.68552E+02 3000.0000  5000.0000 1
1.  1 2.  6-0. -0-0. -0-0. -0-0. -0-0. -0DUFF BAUER 6/61                C2H
 0.11740E+06 0.34962E+05 0.13421E+02 0.46910E-03-0.18751E+07 0.78114E+02  500.0000  3000.0000 1
 0.11740E+06 0.34962E+05 0.14852E+02 0.10940E-03-0.50386E+07 0.78114E+02 3000.0000  5000.0000 1
2.  1 2.  6-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 03/61                    C2H2
 0.54190E+05 0.48257E+05 0.18996E+02 0.76904E-03-0.40904E+07 0.84969E+02  500.0000  3000.0000 1
 0.54190E+05 0.48257E+05 0.20395E+02 0.38906E-03-0.64530E+07 0.84969E+02 3000.0000  5000.0000 1
4.  1 2.  6-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 12/60                    C2H4
 0.12496E+06 0.67683E+05 0.29489E+02 0.52657E-03-0.86531E+07 0.10179E+03  500.0000  3000.0000 1
 0.12496E+06 0.67683E+05 0.31387E+02 0.61624E-04-0.13186E+08 0.10179E+03 3000.0000  5000.0000 1
2.  6 2.  7-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 3/61                     C2N2
 0.73870E+05 0.51107E+05 0.18874E+02 0.55986E-03-0.89687E+06 0.98548E+02  500.0000  3000.0000 1
 0.73870E+05 0.51107E+05 0.20820E+02 0.63023E-03-0.34686E+07 0.98548E+02 3000.0000  5000.0000 1
3.  6-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 12/60                          C3
 0.18967E+06 0.36622E+05 0.14644E+02 0.62254E-04-0.16823E+07 0.79841E+02  500.0000  3000.0000 1
 0.18967E+06 0.36622E+05 0.14478E+02 0.79223E-04-0.64608E+06 0.79841E+02 3000.0000  5000.0000 1
1.  1 1.  7-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 12/60                    HN
 0.79200E+05 0.21766E+05 0.82313E+01 0.28155E-03-0.12690E+07 0.60929E+02  500.0000  3000.0000 1
 0.79200E+05 0.21766E+05 0.76546E+01 0.35985E-03 0.18078E+07 0.60929E+02 3000.0000  5000.0000 1
1.  1 1. 11 0.  0 0.  0 0.  0 0.  0 0.  0JANAF  03/63       AFWL - WRS  HNA
 0.29700E+05 0.24259E+05 0.87443E+01 0.29802E-03-0.26011E+06 0.64802E+02  500.0000  3000.0000 1
 0.29700E+05 0.24259E+05 0.84947E+01 0.29581E-03 0.23454E+07 0.64802E+02 3000.0000  5000.0000 1
1.  1 1.  8 1. 11 0.  0 0.  0 0.  0 0.  0JANAF  03/66       AFWL - WRS  HNAO
-0.50400E+05 0.33110E+05 0.11445E+02 0.72259E-03-0.40275E+06 0.83087E+02  500.0000  3000.0000 1
-0.50400E+05 0.33110E+05 0.12732E+02 0.16961E-03 0.25727E+07 0.83087E+02 3000.0000  5000.0000 1
1.  1 1.  7 1.  8-0. -0-0. -0-0. -0-0. -0JANAF 12/60                    HNO
 0.23800E+05 0.32755E+05 0.13382E+02 0.12206E-03-0.23240E+07 0.78385E+02  500.0000  3000.0000 1
 0.23800E+05 0.32755E+05 0.14152E+02-0.47042E-04-0.46913E+07 0.78385E+02 3000.0000  5000.0000 1
1.  1 1.  8-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 12/60                    HO
 0.93300E+04 0.21404E+05 0.77319E+01 0.39439E-03-0.97356E+06 0.61382E+02  500.0000  3000.0000 1
 0.93300E+04 0.21404E+05 0.96514E+01-0.44353E-04-0.68611E+07 0.61382E+02 3000.0000  5000.0000 1
2.  1-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 03/61                          H2
 0.E+00      0.21210E+05 0.71196E+01 0.62195E-03-0.71269E+06 0.48465E+02  500.0000  3000.0000 1
 0.E+00      0.21210E+05 0.68179E+01 0.58985E-03 0.26511E+07 0.48465E+02 3000.0000  5000.0000 1
2.  1 1.  7-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 12/65                    H2N
 0.40100E+05 0.30580E+05 0.97586E+01 0.11440E-02-0.51897E+06 0.70158E+02  500.0000  3000.0000 1
 0.40100E+05 0.30580E+05 0.13742E+02 0.22949E-04-0.61002E+07 0.70158E+02 3000.0000  5000.0000 1
2.  1 2.  7 0.  0 0.  0 0.  0 0.  0 0.  0T666 LIBRARY                   H2N2
 0.50900E+05 0.43771E+05 0.17222E+02 0.68229E-03-0.32538E+07 0.85103E+02  500.0000  3000.0000 1
 0.50900E+05 0.43771E+05 0.18627E+02 0.19501E-03-0.15474E+07 0.85103E+02 3000.0000  5000.0000 1
2.  1 1.  8-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 03/61                    H2O
-0.57795E+05 0.30201E+05 0.11225E+02 0.81140E-03-0.26080E+07 0.68421E+02  500.0000  3000.0000 1
-0.57795E+05 0.30201E+05 0.15728E+02-0.19155E-03-0.17360E+08 0.68421E+02 3000.0000  5000.0000 1
3.  1 1.  7-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 09/65                    H3N
-0.10970E+05 0.41631E+05 0.12519E+02 0.21967E-02-0.97853E+06 0.76908E+02  500.0000  3000.0000 1
-0.10970E+05 0.41631E+05 0.16632E+02 0.92315E-03-0.36134E+07 0.76908E+02 3000.0000  5000.0000 1
4.  1 2.  7-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 12/65                    H4N2
 0.22790E+05 0.68536E+05 0.22986E+02 0.24193E-02-0.19593E+07 0.10810E+03  500.0000  3000.0000 1
 0.22790E+05 0.68536E+05 0.30432E+02 0.48794E-04-0.13970E+08 0.10810E+03 3000.0000  5000.0000 1
1.  8 1. 11 0.  9 0.  0 0.  0 0.  0 0.  0JANAF  12/60       AFWL - WRS  NAO
 0.13200E+05 0.24347E+05 0.89138E+01 0.13811E-03-0.12322E+06 0.74382E+02  500.0000  3000.0000 1
 0.13200E+05 0.24347E+05 0.87305E+01 0.15925E-03 0.11513E+07 0.74382E+02 3000.0000  5000.0000 1
2. 11 0.  0 0.  0 0.  0 0.  0 0.  0 0.  0JANAF  06/62       AFWL - WRS  NA2
 0.54999E+05 0.25351E+05 0.89424E+01 0.38512E-03-0.84583E+04 0.76634E+02  500.0000  3000.0000 1
 0.54999E+05 0.25351E+05 0.84024E+01 0.46400E-03 0.33403E+07 0.76634E+02 3000.0000  5000.0000 1
```

```
1.  7-0. -0-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 03/61                    N
 0.11297E+06 0.13437E+05 0.49694E+01 0.38352E-04 0.95846E+05 0.48090E+02  500.0000  3000.0000 1
 0.11297E+06 0.13437E+05 0.42896E+01 0.24084E-03-0.41727E+06 0.48090E+02 3000.0000  5000.0000 1
1.  7 1.  8-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 06/63                    NO
 0.21580E+05 0.22700E+05 0.87762E+01 0.89903E-04-0.78966E+06 0.68849E+02  500.0000  3000.0000 1
 0.21580E+05 0.22700E+05 0.91626E+01 0.65788E-05-0.21252E+07 0.68849E+02 3000.0000  5000.0000 1
1.  7 2.  8-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 06/63                    NO2
 0.80110E+04 0.34580E+05 0.13782E+02 0.31561E-04-0.13376E+07 0.84889E+02  500.0000  3000.0000 1
 0.80110E+04 0.34580E+05 0.13115E+02 0.17259E-03 0.17534E+07 0.84889E+02 3000.0000  5000.0000 1
1.  7 3.  8-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 12/64                    NO3
 0.17[illegible]E+05 0.49822E+05 0.13230E+02 0.19116E-03-0.11213E+07 0.99897E+02  500.0000  3000.0000 1
 0.17000E+05 0.49822E+05 0.19871E+02 0.57714E-07-0.17291E+07 0.99897E+02 3000.0000  5000.0000 1
2.  7 1.  8-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 12/60                    N2O
 0.19503E+05 0.36545E+05 0.14469E+02 0.12049E-03-0.15348E+07 0.81590E+02  500.0000  3000.0000 1
 0.19503E+05 0.36545E+05 0.12304E+02 0.45902E-03 0.94238E+07 0.81590E+02 3000.0000  5000.0000 1
2.  7 3.  8-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 12/64                    N2O3
 0.19600E+05 0.61780E+05 0.23212E+02 0.47758E-03-0.12410E+07 0.12322E+03  500.0000  3000.0000 1
 0.19600E+05 0.61780E+05 0.24830E+02 0.10287E-05-0.29389E+07 0.12322E+03 3000.0000  5000.0000 1
2.  7 4.  8-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 9/64                     N2O4
 0.21700E+04 0.78597E+05 0.29773E+02 0.59443E-03-0.17883E+07 0.13491E+03  500.0000  3000.0000 1
 0.21700E+04 0.78597E+05 0.31782E+02 0.17563E-05-0.38597E+07 0.13491E+03 3000.0000  5000.0000 1
2.  7 5.  8-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 12/64                    N2O5
 0.21700E+04 0.91576E+05 0.35305E+02 0.14730E-03-0.16385E+07 0.15672E+03  500.0000  3000.0000 1
 0.21700E+04 0.91576E+05 0.35736E+02 0.62455E-05-0.17127E+07 0.15672E+03 3000.0000  5000.0000 1
1.  8-0. -0-0. -0-0. -0-0. -0-0. -0-0. -0JANAF 06/62                    O
 0.59559E+05 0.13522E+05 0.49723E+01 0.38077E-05 0.15475E+05 0.50096E+02  500.0000  3000.0000 1
 0.59559E+05 0.13522E+05 0.65749E+01-0.22427E-03-0.89178E+07 0.50096E+02 3000.0000  5000.0000 1
1. 99-0. -0-0. -0-0. -0-0. -0-0. -0-0. -0JANAF   05/65     AFWL - JEF    E-
 0.E+00      0.13423E+05 0.49680E+01 0.21533E-05 0.26284E-06 0.16459E+02  500.0000  3000.0000 1
 0.E+00      0.13423E+05 0.49680E+01-0.23237E-06-0.98622E-06 0.16459E+02 3000.0000  5000.0000 1
1.  6-1. 99 0.  0 0.  0 0.  0 0.  0 0.  0AFWL TDR 64-44 NORM TO 298 JEFC+1
 0.43243E+06 0.13435E+05 0.49685E+01-0.13100E-06 0.33897E+04 0.48432E+02  500.0000  3000.0000 1
 0.43243E+06 0.13435E+05 0.49516E+01 0.32381E-05 0.64611E+05 0.48432E+02 3000.0000  5000.0000 1
1. 11-1. 99-0. -0-0. -0-0. -0-0. -0-0. -0                               NA+
 0.14383E+06 0.13423E+05 0.49681E+01-0.E+00      -0.E+00      0.46807E+02  500.0000  6000.0000 1
 0.14383E+06 0.13423E+05 0.49681E+01-0.E+00      -0.E+00      0.46807E+02  500.0000  6000.0000 1
1.  7 1.  8-1. 99-0. -0-0. -0-0. -0-0. -0JANAF   06/66       AFWL - WRS   NO+
 0.23666E+06 0.22150E+05 0.77453E+01 0.41834E-03-0.26976E+06 0.65332E+02  500.0000  3000.0000 1
 0.23666E+06 0.22150E+05 0.82958E+01 0.13003E-03 0.21840E+07 0.65332E+02 3000.0000  5000.0000 1
1.  8 1. 99-0. -0-0. -0-0. -0-0. -0JANAF   06/65       AFWL - WRS   O-
 0.24300E+05 0.13482E+05 0.49669E+01 0.69157E-06 0.19878E+05 0.49285E+02  500.0000  3000.0000 1
 0.24300E+05 0.13482E+05 0.49695E+01-0.18003E-06 0.13858E+05 0.49285E+02 3000.0000  5000.0000 1
1.  6 1. 99 0. -0 0. -0 0. -0 0. -0 0. -0JANAF    09-65      AFWL-NV      C-
 0.14050E+06 0.13437E+05 0.49121E+01 0.32137E-04 0.13255E+05 0.47631E+02  500.0000  3000.0000 1
 0.14050E+06 0.13437E+05 0.24423E+01 0.57317E-03 0.76335E+07 0.47631E+02 3000.0000  6000.0000 1
1.  1-1. 99 0. -0 0. -0 0. -0 0. -0 0. -0AFWL TDR 64-44 NORM TO 298 JEFH+1
 0.36716E+06 0.13423E+05 0.49679E+01-0.59624E-05-0.30407E-06 0.37482E+02  500.0000  3000.0000 1
 0.36716E+06 0.13423E+05 0.49679E+01-0.26722E-05-0.11342E-04 0.37482E+02 3000.0000  5000.0000 1
1.  1 1.  8 1. 99 0. -0 0. -0 0. -0JANAF    3-66       AFWL-NV      HO-1
-0.34400E+05 0.21324E+05 0.67498E+01 0.71985E-03-0.63892E+05 0.58582E+02  500.0000  3000.0000 1
-0.34400E+05 0.21324E+05 0.78160E+01 0.25045E-03 0.28756E+07 0.58582E+02 3000.0000  6000.0000 1
3.  1 1.  8-1. 99 0.  0 0.  0 0.  0 0.  0JANAF   06/66       AFWL - WRS   H3O+1
 0.13893E+06 0.40293E+05 0.11455E+02 0.23531E-02-0.91644E+06 0.75901E+02  500.0000  3000.0000 1
 0.13893E+06 0.40293E+05 0.15[illegible]1E+02 0.50583E-03 0.77356E+07 0.75901E+02 3000.0000  6000.0000 1
1.  7-1. 99 0.  0 0.  0 0.  0 0.  0 0.  0AFWL TDR 64-44 NORM TO 298 JEFN+1
 0.44959E+06 0.13472E+05 0.48933E+01 0.33813E-04 0.56329E+05 0.49702E+02  500.0000  3000.0000 1
 0.44959E+06 0.13472E+05 0.45180E+01 0.13767E-03 0.62970E+06 0.49702E+02 3000.0000  5000.0000 1
1.  7 2.  8 1. 99 0. -0 0. -0 0. -0 0. -0JANAF    12-65      AFWL-NV      NO2-
-0.85903E+05 0.35315E+05 0.13348E+02 0.19039E-03-0.71000E+06 0.84593E+02  500.0000  3000.0000 1
-0.85903E+05 0.35315E+05 0.13535E+02 0.54880E-04 0.10530E+07 0.84593E+02 3000.0000  6000.0000 1
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2.   7-1. 99 C. -0 G. -0 0. -1 0. -0 0. -0BROWNE  EPTM-3 SWAG AFWL-NV   N2+1
 0.35931E+06 0.25224E+05 0.69536E+01 0.10324E-02-0.98388E+05 0.65686E+02  500.0000  3000.0000 1
 0.35931E+06 0.25224E+05 0.10644E+02 0.90355E-04-0.51873E+07 0.65686E+02 3000.0000  5000.0000 1
1.   8-1. 99 0.  0 0.  0 0.  0 0.  0 0.  0AFWL TDR 64-44 NORM TO 298 JEF0+1
 0.37507E+06 0.13424E+05 0.43645E+01 0.15476E-05 0.24063E+04 0.48481E+02  500.0000  3000.0000 1
 0.37507E+06 0.13424E+05 0.42673E+01 0.14641E-03 0.23662E+07 0.48481E+02 3000.0000  5000.0000 1
2.   8-1. 99-0. -0-0. -0-0. -0-0. -0-0. -0BROWNE  EPTM-3    AFWL-NV     02+1
 0.23149E+06 0.22720E+05 0.82125E+01 0.29541E-03-0.31791E+06 0.67752E+02  500.0000  3000.0000 1
 0.23149E+06 0.22720E+05 0.75926E+01 0.30706E-03 0.43952E+07 0.67752E+02 3000.0000  5000.0000 1
2.   8 1. 99-0. -0-0. -0-0. -0-0. -0-0. -0JANAF  12/66       AFWL - WRS  02-
-0.11397E+05 0.23585E+05 0.87430E+01 0.14773E-03-0.26066E+06 0.69305E+02  500.0000  3000.0000 1
-0.11397E+05 0.23585E+05 0.84368E+01 0.16034E-03 0.16846E+07 0.69305E+02 3000.0000  6000.0000 1
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ELEMENT	HYDROGEN	CARBON	NITROGEN	OXYGEN	SODIUM	ELECTRON
BASE SP	H	C	N2	02	NA	E-

MOLECULAR TRANSPORT PROPERTIES

VISCOSITY ..... BUDDENBERG - WILKE MIXTURE FORMULA WITH MU(I) CALCULATED ON THE BASIS OF D(I,I) = DBAR/G(I)**2

THERMAL CONDUCTIVITY ..... MASON - SAXENA MIXTURE FORMULA WITH EUCKEN CORRECTION

DIFFUSION COEFFICIENTS ..... D(I,J) = DBAR/(F(I)*F(J)) WITH DBAR BASED ON SIGMA = 3.4670, EPOVRK = 106.7000, AND MREF = 32.0000

METHODS EMPLOYED

0 CONDENSED PHASE, VALUES FOR F(I) AND G(I) SET EQUAL TO 1.E+10

1 VALUES FOR F(I) (OR G(I)) INPUT DIRECTLY

2 VALUES FOR F(I) (OR G(I)) CALCULATED BY F(I) =(M(I)/FITMOL)**FFA AND G(I) = (M(I)/FITGMW)**GGA WHERE M(I) IS SPECIES MOLECULAR WEIGHT, FITMOL = 26.7000, AND FFA = 0.4890, FITGMW = 24.3000, AND GGA = 0.4540

3 VALUES FOR G(I) CALCULATED BY G(I) = SQRT(DBAR/D(I,I)) = (SIGMA(I)/SIGMA) * (EPS(I)/EPOVRK) **0.0795 * (M(I)/MREF) **0.25 WHERE SIGMA(I) AND EPS(I) ARE GIVEN WITH THERMODYNAMIC DATA

SPECIES	F(I)	METHOD	G(I)	METHOD	SPECIES	F(I)	METHOD	G(I)	METHOD
H	0.201	2	0.236	2	C	0.677	2	0.726	2
NA	0.929	2	0.975	2	O2	1.093	2	1.133	2
N2	1.024	2	1.067	2	E-	0.005	2	0.008	2
CH	0.704	2	0.753	2	CHN	1.006	2	1.049	2
CHNO	1.263	2	1.296	2	CHO	1.042	2	1.084	2
CH2	0.730	2	0.779	2	CH2O	1.059	2	1.101	2
CH4	0.788	2	0.828	2	CN	0.987	2	1.032	2
CNNA	1.346	2	1.375	2	CO	1.024	2	1.067	2
CO2	1.277	2	1.310	2	C2	0.950	2	0.995	2
C2H	0.965	2	1.014	2	C2H2	0.988	2	1.032	2
C2H4	1.032	2	1.067	2	C2N2	1.386	2	1.413	2
C3	1.158	2	1.196	2	HN	0.755	2	0.804	2
HNA	0.949	2	0.994	2	HNAO	1.219	2	1.254	2
NO	1.076	2	1.117	2	HO	0.802	2	0.850	2
H2	0.293	2	0.323	2	H2N	0.779	2	0.828	2

H2N2	1.059	2	1.101	2	H2O	0.825	2	0.873	2
H3N	0.803	2	0.851	2	H4N2	1.093	2	1.134	2
NAO	1.203	2	1.239	2	NA2	1.304	2	1.336	2
N	0.729	2	0.779	2	NO	1.059	2	1.101	2
NO2	1.305	2	1.336	2	NO3	1.513	2	1.538	2
N2O	1.277	2	1.310	2	N2O3	1.668	2	1.678	2
N2O4	1.831	2	1.830	2	N2O5	1.981	2	1.969	2
O	0.778	2	0.827	2	C+1	0.677	2	0.726	2
NA+	0.929	2	0.975	2	NO+	1.059	2	1.101	2
O-	0.778	2	0.827	2	C-	0.677	2	0.726	2
H+1	0.201	2	0.236	2	HO-1	0.802	2	0.850	2
H3O+1	0.847	2	0.895	2	N+1	0.729	2	0.779	2
NO2-	1.305	2	1.336	2	N2+1	1.024	2	1.067	2
O+1	0.778	2	0.827	2	O2+1	1.093	2	1.133	2
O2-	1.093	2	1.133	2					

STAGNATION SOLUTION FOLLOWED BY BOUNDARY-LAYER EDGE EXPANSION

STREAM FUNCTION,LB/SEC 0.E+00 0.15143E+00 0.60573E+00 0.13842E+01 0.25360E+01 0.40707E+01 0.58508E+01 0.77336E+01
0.11523E+02 0.16010E+02 0.23832E+02 0.35922E+02 0.63090E+02 0.98741E+02 0.14606E+03 0.25475E+03
0.39137E+03 0.83722E+03

SHOCK ANGLE,RADIANS 0.E+00 0.35630E+00 0.69310E+00 0.94710E+00 0.11387E+01 0.12418E+01 0.13012E+01 0.13370E+01
0.13768E+01 0.13933E+01 0.14109E+01 0.14249E+01 0.14323E+01 0.14166E+01 0.14065E+01 0.14011E+01
0.14009E+01 0.14011E+01

CP-FROZEN	CP-EQUIL	DLNM/DLNT	DLNM/DLNP	GAMMA
0.31871E+00	0.60967E+00	-0.32204E+00	0.30799E-01	0.12339E+01

TEMP = 5518.0909 DEG-K PRES =149.9100 ATM MOL WT = 25.8520972
RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
ENTHALPY = 0.2168500E+04 CAL/GM ENTROPY = 0.22662E+01 CAL/GM-DEG K
DENSITY = 0.534249E+00 LB/CUFT
VEL = 0.E+00 FT/SEC MACH = 0.E+00 AREA = 0.E+00 SQFT/LB/SEC

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
H	0.E+00	C	0.E+00	NA	0.E+00
O2	0.39381E-01	N2	0.65319E+00	E-	0.25528E-04
CH	0.E+00	CHN	0.E+00	CHNO	0.E+00
CHO	0.E+00	CH2	0.E+00	CH2O	0.E+00
CH4	0.E+00	CN	0.E+00	CNNA	0.E+00
CO	0.E+00	CO2	0.E+00	C2	0.E+00
C2H	0.E+00	C2H2	0.E+00	C2H4	0.E+00
C2N2	0.E+00	C3	0.E+00	HN	0.E+00
HNA	0.E+00	HNAO	0.E+00	HNO	0.E+00
HO	0.E+00	H2	0.E+00	H2N	0.E+00
H2N2	0.E+00	H2O	0.E+00	H3N	0.E+00
H4N2	0.E+00	NAO	0.E+00	NA2	0.E+00
N	0.65671E-02	NO	0.98618E-01	NO2	0.96218E-04
NO3	0.57493E-08	N2O	0.66960E-14	N2O3	0.56400E-09
N2O4	0.66999E-13	N2O5	0.29821E-15	O	0.20201E+00
C+1	0.E+00	NA+	0.E+00	NO+	0.23661E-04
O-	0.74936E-05	C-	0.E+00	H+1	0.E+00
HO-1	0.E+00	H3O+1	0.E+00	N+1	0.30253E-09
NO2-	0.13940E-06	N2+1	0.38510E-08	O+1	0.12753E-07
O2+1	0.10733E-04	O2-	0.45972E-06		

CP-FROZEN	CP-EQUIL	DLNM/DLNT	DLNM/DLNP	GAMMA
0.31378E+00	0.65321E+00	-0.23399E+00	0.12891E-01	0.11794E+01

TEMP = 3303.3513 DEG-K PRES = 4.1459 ATM MOL WT = 28.0658265
RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
ENTHALPY = 0.1035973E+04 CAL/GM ENTROPY = 0.22662E+01 CAL/GM-DEG K
DENSITY = 0.267947E-01 LB/CUFT
VEL = 0.101E+05 FT/SEC MACH = 0.287E+01 AREA = 0.369E-02 SQFT/LB/SEC

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
H	0.E+00	C	0.E+00	NA	0.E+00
O2	0.15024E+00	N2	0.73803E+00	E-	0.10515E-06
CH	0.E+00	CHN	0.E+00	CHNO	0.E+00
CHO	0.E+00	CH2	0.E+00	CH2O	0.E+00
CH4	0.E+00	CN	0.E+00	CNNA	0.E+00
CO	0.E+00	CO2	0.E+00	C2	0.E+00
C2H	0.E+00	C2H2	0.E+00	C2H4	0.E+00
C2N2	0.E+00	C3	0.E+00	HN	0.E+00
HNA	0.E+00	HNAO	0.E+00	HNO	0.E+00
HO	0.E+00	H2	0.E+00	H2N	0.E+00
H2N2	0.E+00	H2O	0.E+00	H3N	0.E+00
H4N2	0.E+00	NAO	0.E+00	NA2	0.E+00
N	0.34502E-04	NO	0.56573E-01	NO2	0.41164E-04
NO3	0.34430E-09	N2O	0.58569E-05	N2O3	0.46282E-11
N2O4	0.33175E-15	N2O5	0.47099E-18	O	0.55074E-01
C+1	0.E+00	NA+	0.E+00	NO+	0.73026E-07
O-	0.66765E-08	C-	0.E+00	H+1	0.E+00
HO-1	0.E+00	H3O+1	0.E+00	N+1	0.48831E-17
NO2-	0.45736E-07	N2+1	0.24381E-14	O+1	0.39116E-13
O2+1	0.85910E-07	O2-	0.13713E-08		

TEMP = 5469.8950 DEG-K PRES =145.7704 ATM MOL WT = 25.9031093
RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
ENTHALPY = 0.2142874E+04 CAL/GM ENTROPY = 0.22637E+01 CAL/GM-DEG K
DENSITY = 0.525108E+00 LB/CUFT

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
H	0.E+00	C	0.E+00	NA	0.E+00
O2	0.41021E-01	N2	0.65459E+00	E-	0.23602E-04
CH	0.E+00	CHN	0.E+00	CHNO	0.E+00
CHO	0.E+00	CH2	0.E+00	CH2O	0.E+00
CH4	0.E+00	CN	0.E+00	CNNA	0.E+00
CO	0.E+00	CO2	0.E+00	C2	0.E+00
C2H	0.E+00	C2H2	0.E+00	C2H4	0.E+00
C2N2	0.E+00	C3	0.E+00	HN	0.E+00
HNA	0.E+00	HNAO	0.E+00	HNO	0.E+00
HO	0.E+00	H2	0.E+00	H2N	0.E+00
H2N2	0.E+00	H2O	0.E+00	H3N	0.E+00
H4N2	0.E+00	NAO	0.E+00	NA2	0.E+00
N	0.60670E-02	NO	0.99115E-01	NO2	0.98416E-04
NO3	0.58482E-08	N2O	0.65337E-04	N2O3	0.56421E-09
N2O4	0.67975E-13	N2O5	0.30428E-15	O	0.19898E+00
C+1	0.E+00	NA+	0.E+00	NO+	0.21809E-04
O-	0.60962CE-05	C-	0.E+00	H+1	0.E+00
HO-1	0.E+00	H3O+1	0.E+00	N+1	0.23239E-09
NO2-	0.95076E-06	N2+1	0.3131+E-08	O+1	0.10522E-07
O2+1	0.10136E-04	O2-	0.44413E-06		

TEMP = 441.2483 DEG-K PRES = 4.0131 ATM MOL WT = 28.8603830
RELATIVE MASSES OF COMPONENTS 1,2 AND 3 0.E+00 0.E+00 0.E+00
ENTHALPY = 0.4994597E+02 CAL/GM ENTROPY = 0.16717E+01 CAL/GM-DEG K
DENSITY = 0.199666E+00 LB/CUFT

SPECIES	MOLE FR.	SPECIES	MOLE FR.	SPECIES	MOLE FR.
H	0.E+00	C	0.E+00	NA	0.E+00
O2	0.21194E+00	N2	0.78806E+00	E-	0.E+00
CH	0.E+00	CHN	0.E+00	CHNO	0.E+00
CHO	0.E+00	CH2	0.E+00	CH2O	0.E+00
CH4	0.E+00	CN	0.E+00	CNNA	0.E+00
CO	0.E+00	CO2	0.E+00	C2	0.E+00
C2H	0.E+00	C2H2	0.E+00	C2H4	0.E+00
C2N2	0.E+00	C3	0.E+00	HN	0.E+00
HNA	0.E+00	HNAO	0.E+00	HNO	0.E+00
HO	0.E+00	H2	0.E+00	H2N	0.E+00
H2N2	0.E+00	H2O	0.E+00	H3N	0.E+00
H4N2	0.E+00	NAO	0.E+00	NA2	0.E+00
N	0.56837E-53	NO	0.36064E-20	NO2	0.23792E-07
NO3	0.14941E-16	N2O	0.20801E-13	N2O3	0.95752E-20
N2O4	0.10479E-16	N2O5	0.86286E-20	O	0.83928E-27
C+1	0.E+00	NA+	0.E+00	NO+	0.E+00
O-	0.E+00	C-	0.E+00	H+1	0.E+00
HO-1	0.E+00	H3O+1	0.E+00	N+1	0.E+00
NO2-	0.E+00	N2+1	0.E+00	O+1	0.E+00
O2+1	0.E+00	O2-	0.E+00		

DISTANCE,FT	0.E+00	0.40000E-02	0.80000E-02	0.13000E-01	0.17000E-01	0.25000E-01	0.35000E-01	0.45000E-01
	0.55000E-01	0.69632E-01	0.83000E-01	0.98000E-01	0.75000E-01	0.86000E-01	0.96000E-01	0.12000E+00
	0.15000E+00	0.21000E+00	0.31000E+00	0.44170E+00	0.60000E+00	0.86400E+00	0.86500E+00	0.10000E+01
	0.12957E+01	0.15000E+01	0.17065E+01	0.21272E+01	0.25480E+01	0.29687E+01	0.33895E+01	0.38103E+01
	0.42310E+01	0.50725E+01	0.59141E+01	0.67500E+01	0.68000E+01	0.69239E+01	0.70922E+01	
MACH	0.E+00	0.39939E-02	0.79879E-02	0.12790E-01	0.16532E-01	0.23527E-01	0.31027E-01	0.38748E-01
	0.40363E-01	0.41260E-01	0.41779E-01	0.42425E-01	0.43399E-01	0.44930E-01	0.46600E-01	0.49662E-01
	0.53837E-01	0.62187E-01	0.76104E-01	0.94433E-01	0.11646E+00	0.15321E+00	0.15335E+00	0.17213E+00
	0.21149E+00	0.24172E+00	0.27946E+00	0.32901E+00	0.38757E+00	0.44612E+00	0.50469E+00	0.56325E+00
	0.62180E+00	0.73891E+00	0.85604E+00	0.97238E+00	0.97933E+00	0.99658E+00	0.10200E+01	
AI,(LB/SEC)**2	0.E+00	0.40556E-09	0.69828E-08	0.38212E-07	0.11378E-06	0.45553E-06	0.12687E-05	0.22956E-05
	0.31948E-05	0.34325E-05	0.36018E-05	0.38594E-05	0.42209E-05	0.47944E-05	0.54295E-05	0.60097E-05
	0.82973E-05	0.12113E-04	0.23830E-04	0.52418E-04	0.84509E-04	0.16956E-03	0.16982E-03	0.20890E-03
	0.32975E-03	0.46405E-03	0.63764E-03	0.11548E-02	0.19353E-02	0.30218E-02	0.44451E-02	0.62357E-02
	0.84321E-02	0.14217E-01	0.22147E-01	0.32492E-01	0.33196E-01	0.34985E-01	0.37517E-01	
PRESSURE RATIO	0.10000E+01	0.98910E+00	0.95637E+00	0.88795E+00	0.81501E+00	0.63932E+00	0.40627E+00	0.21839E+00
	0.99156E-01	0.65578E-01	0.53805E-01	0.61907E-01	0.59205E-01	0.55102E-01	0.51021E-01	0.44784E-01
	0.38419E-01	0.35425E-01	0.23982E-01	0.20536E-01	0.19076E-01	0.19066E-01	0.19068E-01	0.19511E-01
	0.21154E-01	0.22582E-01	0.23890E-01	0.26026E-01	0.27384E-01	0.27964E-01	0.27971E-01	0.27848E-01
	0.27754E-01	0.27659E-01	0.27633E-01	0.27647E-01	0.27649E-01	0.27652E-01	0.27656E-01	
STATIC PRESSURE,ATM	0.14991E+03	0.14628E+03	0.14337E+03	0.13311E+03	0.12218E+03	0.95840E+02	0.60904E+02	0.32739E+02
	0.14864E+02	0.98308E+01	0.95650E+01	0.92805E+01	0.88754E+01	0.82603E+01	0.76486E+01	0.67136E+01
	0.57579E+01	0.45610E+01	0.35951E+01	0.30786E+01	0.28597E+01	0.28582E+01	0.28585E+01	0.29249E+01
	0.31712E+01	0.33853E+01	0.35813E+01	0.39016E+01	0.41051E+01	0.41921E+01	0.41931E+01	0.41747E+01
	0.41606E+01	0.41464E+01	0.41425E+01	0.41446E+01	0.41449E+01	0.41453E+01	0.41459E+01	
EDGE VELOCITY,FT/SEC	0.E+00	0.64682E+03	0.13029E+04	0.21191E+04	0.27691E+04	0.40494E+04	0.56301E+04	0.71250E+04
	0.85054E+04	0.90888E+04	0.91249E+04	0.91643E+04	0.92220E+04	0.93132E+04	0.94088E+04	0.95661E+04
	0.97444E+04	0.10001E+05	0.10248E+05	0.10401E+05	0.10472E+05	0.10472E+05	0.10472E+05	0.10450E+05
	0.10372E+05	0.10308E+05	0.10252E+05	0.10165E+05	0.10112E+05	0.10090E+05	0.10090E+05	0.10095E+05
	0.10098E+05	0.10102E+05	0.10103E+05	0.10102E+05	0.10102E+05	0.10102E+05	0.10102E+05	
BETA	0.50000E+00	0.48990E+00	0.54247E+00	0.46119E+00	0.51659E+00	0.59045E+00	0.72065E+00	0.96311E+00
	0.16197E+01	0.93771E+00	-0.42260E-01	0.12493E+00	0.14732E+00	0.16109E+00	0.16755E+00	0.16806E+00
	0.15872E+00	0.13105E+00	0.10135E+00	0.66422E-01	0.18488E-01	-0.35224E-01	-0.12705E-01	-0.27870E-01
	-0.37119E-01	-0.36284E-01	-0.32725E-01	-0.24483E-01	-0.14696E-01	-0.37530E-02	0.27564E-02	0.29995E-02
	0.19601E-02	0.78165E-03	0.34900E-04	-0.70439E-03	-0.59684E-03	-0.32882E-03	-0.42781E-03	
INCIDENT RADIATION FLUX	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	
ENTROPY DROP,BTU/LB R	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	
-1/FLUX NORM. PARAMETER	-0.28670E+00	-0.27160E+00	-0.28987E+00	-0.27749E+00	-0.30677E+00	-0.36887E+00	-0.51006E+00	-0.81299E+00
	-0.15146E+01	-0.21266E+01	-0.22011E+01	-0.22953E+01	-0.24311E+01	-0.26502E+01	-0.28923E+01	-0.33272E+01
	-0.38976E+01	-0.49409E+01	-0.69073E+01	-0.94081E+01	-0.10311E+02	-0.11106E+02	-0.11103E+02	-0.10760E+02
	-0.10256E+02	-0.10094E+02	-0.10087E+02	-0.10386E+02	-0.10939E+02	-0.11669E+02	-0.12508E+02	-0.13323E+02
	-0.14173E+02	-0.15422E+02	-0.16627E+02	-0.17723E+02	-0.17786E+02	-0.17941E+02	-0.18150E+02	

WALL TEMPERATURE,DEG R	0.79860E+04	0.79990E+04	0.79740E+04	0.79560E+04	0.79130E+04	0.77980E+04	0.77660E+04	0.75520E+04
	0.72510E+04	0.70830E+04	0.70550E+04	0.70280E+04	0.69950E+04	0.69560E+04	0.69190E+04	0.68360E+04
	0.67480E+04	0.65950E+04	0.63630E+04	0.62550E+04	0.61760E+04	0.61550E+04	0.59940E+04	0.59350E+04
	0.59930E+04	0.60310E+04	0.60660E+04	0.61060E+04	0.60850E+04	0.61020E+04	0.61090E+04	0.60710E+04
	0.60760E+04	0.60830E+04	0.60890E+04	0.60400E+04	0.60410E+04	0.60430E+04	0.60460E+04	
COMP FLUX,LB/SEC FT**2	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	
COMP FLUX,LB/SEC FT**2	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00
	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	-0.E+00	
COMP FLUX,LB/SEC FT**2	0.47510E+00	0.50580E+00	0.47330E+00	0.46960E+00	0.43990E+00	0.35860E+00	0.80410E+00	0.55010E+00
	0.29080E+00	0.19190E+00	0.17890E+00	0.17110E+00	0.16210E+00	0.15190E+00	0.14200E+00	0.12450E+00
	0.10850E+00	0.86430E-01	0.65980E-01	0.57640E-01	0.53830E-01	0.53930E-01	0.67290E-01	0.71120E-01
	0.77940E-01	0.85710E-01	0.94290E-01	0.11100E+00	0.11610E+00	0.12180E+00	0.12260E+00	0.11570E+00
	0.11430E+00	0.11570E+00	0.11480E+00	0.10710E+00	0.10740E+00	0.10780E+00	0.10820E+00	

CASE 2 - - - - - - - - - - - - - STREAMWISE DIMENSION 0.E+00 FEET - - - -

ITERATED VALUES

ITS	TIME	ALPHA	FPPW DAMP	MAX.LIN ERROR	MAX.ERRORS IN CONSERVATION EQS. MOMENTUM	ENERGY	H	C	NA	O2	
1	21.857	3.640	0.41020.2563	2E+00	16-3.2E+00	13-1.8E+03	2 0.E+00	1 1.8E-01	1 9.2E-04	1-4.1E-02	0
2	32.909	3.276	0.46890.3002	2E+00	16-2.2E+00	14 1.1E+03	2 0.E+00	1 1.3E-01	1-2.3E-04	1-3.1E-02	0
3	41.950	2.948	0.55000.3367	1E+00	16-1.4E+00	14 8.8E+02	2 0.E+00	1 9.4E-02	1-1.6E-04	1-2.2E-02	0
4	57.155	2.654	0.64380.4242	8E-01	16-8.8E-01	1 7.3E+02	2 0.E+00	1 6.8E-02	1-1.1E-04	1-1.6E-02	0
5	63.343	2.388	0.74940.6063	4E-01	16-4.8E-01	1 6.6E+02	2 0.E+00	1 4.2E-02	1-6.6E-05	1-9.8E-03	0
6	75.699	2.277	0.70801.0000	2E-01	18-2.1E-01	1 2.7E+02	2 0.E+00	1 1.6E-02	1-2.7E-05	1-3.7E-03	0
7	86.530	2.273	0.70721.0010	5E-03	12-2.3E-02	10-5.7E+01	2 0.E+00	14-1.2E-03	13 7.7E-07	15 2.8E-04	0
8	94.741	2.270	0.70721.0000	2E-05	14 5.1E-04	11 6.0E-01	2 0.E+00	11-3.0E-05	14 1.4E-09	11 7.1E-06	0
9	111.466	2.270	0.70721.0000	9E-07	14 7.0E-06	11 2.1E-02	2 0.E+00	11-5.3E-07	11-5.3E-13	11 1.2E-07	0

ALPHA	XI (LB/SEC)**2	ROKAP (FT)	PRESSURE (ATM)	EDGE VELOCITY (FT/SEC)	BETA	FLUX NORMALIZING PARAMETER	HEAT FLUXES DIFFUSIONAL	TOT ENTH (BTU/SEC SQ FT)	RERAD	QCOND
2.270E+00	0.E+00	0.E+00	1.499E+02	0.E+00	5.000E-01	3.483E+00	3.581E+03	2.536E+03	0.E+00	6.087E+03

WALL SHEAR (LB/SQ FT)	MASS FLUXES (LB/SEC SQ FT) MECH REM	PYROL GAS	CHAR	TOTAL GAS	ELEMENTAL MASS DIFFUSIVE FLUXES (LB/SEC SQ FT) FOR HYDROGEN	CARBON	NITROGEN	OXYGEN	SODIUM
0.E+00	0.E+00	0.E+00	4.759E-01	4.759E-01	0.E+00	-3.875E-01	2.964E-01	9.106E-02	-3.875E-07

MOM TRANS COEFF, RHO*UE*CF/2	HEAT TRANS COEFF, RHO*UE*CH	BLOWING PARAMETERS (BASED ON CH) FOR PYROL GAS	CHAR	TOTAL GAS	ELEMENTAL MASS TRANSFER COEFFICIENTS, RHOE*UE*CM (LB/SEC SQ FT) FOR HYDROGEN	CARBON	NITROGEN	OXYGEN	SODIUM
2.924E+00	2.097E+00	0.E+00	2.269E-01	2.269E-01	IIIII	2.086E+00	2.086E+00	2.086E+00	2.086E+00

MOMENTUM THICKNESS, THETA (FT)	DISPLACE. THICKNESS, DELSTAR (FT)	EFFECTIVE BODY DISPLACE. (FT)	ENTHALPY THICKNESS, LAMBDA (FT)	REYNOLDS NUMBER PER FOOT	MASS THICKNESSES (FT) FOR HYDROGEN	CARBON	NITROGEN	OXYGEN	SODIUM
7.118E-06	1.624E-05	1.921E-05	1.623E-05	0.E+00	IIIII	1.616E-05	1.616E-05	1.616E-05	1.615E-05

NODAL INFORMATION

DISTANCE, FROM WALL (FT)	ETA	F	FP (=U/UE)	FPP	SHEAR (LB/FTSQ)	TOTAL ENTHALPY,G (BTU/LB)	GP (BTU/LB)	GPP (BTU/LB)	STATIC ENTHALPY (BTU/LB)	TEMP (DEG R)	ELECTRON COLL FREQ (1/SEC)
0.E+00	0.E+00	-1.364E-01	0.E+00	7.572E-01	0.E+00	2.196E+03	5.900E+02	1.585E+02	2.196E+03	7.986E+03	1.309E+13
[illegible]	4.563E-03	-1.364E-01	3.216E-03	7.369E-01	0.E+00	2.199E+03	5.987E+02	1.588E+02	2.199E+03	[illegible]	1.307E+13
[illegible]	9.389E-03	-1.364E-01	6.418E-03	7.365E-01	0.E+00	2.201E+03	5.994E+02	1.588E+02	2.201E+03	8.014E+03	1.306E+13
2.573E-07	1.509E-02	-1.364E-01	1.123E-02	7.060E-01	0.E+00	2.205E+03	6.005E+02	1.588E+02	2.205E+03	8.036E+03	1.304E+13
4.423E-07	2.724E-02	-1.362E-01	1.924E-02	7.051E-01	0.E+00	2.212E+03	6.023E+02	1.587E+02	2.212E+03	8.072E+03	1.302E+13
[illegible]	[illegible]	-1.357E-01	3.233E-02	7.037E-01	0.E+00	2.223E+03	6.052E+02	1.584E+02	2.223E+03	8.131E+03	1.297E+13
[illegible]	[illegible]	[illegible]	4.798E-02	7.017E-01	0.E+00	2.237E+03	6.088E+02	1.573E+02	2.237E+03	8.206E+03	1.291E+13
[illegible]	[illegible]	[illegible]	7.974E-02	6.975E-01	0.E+00	2.265E+03	[illegible]	1.519E+02	2.265E+03	8.364E+03	1.279E+13
[illegible]	[illegible]	[illegible]	[illegible]	6.847E-01	0.E+00	2.336E+03	[illegible]	1.647E+02	2.336E+03	8.613E+03	1.246E+13
[illegible]	[illegible]	[illegible]	[illegible]	6.459E-01	0.E+00	2.494E+03	[illegible]	9.995E+01	2.484E+03	1.001E+04	1.169E+13
[illegible]	[illegible]	[illegible]	[illegible]	5.314E-01	0.E+00	2.718E+03	[illegible]	-5.736E+01	2.718E+03	1.027E+04	1.154E+13
[illegible]	1.135E+00	[illegible]	6.698E-01	4.097E-01	0.E+00	2.954E+03	6.847E+02	-2.435E+02	2.954E+03	1.017E+04	1.160E+13
[illegible]	[illegible]	[illegible]	[illegible]	9.485E-02	0.E+00	3.575E+03	4.084E+02	-2.681E+02	3.575E+03	9.992E+03	1.170E+13
[illegible]	[illegible]	[illegible]	1.017E+00	-4.427E-03	0.E+00	3.882E+03	4.321E+01	-5.409E+01	3.882E+03	9.936E+03	1.173E+13
[illegible]	5.675E+00	[illegible]	[illegible]	5.344E-03	0.E+00	3.903E+03	0.E+00	1.178E+01	3.903E+03	9.933E+03	1.173E+13

DISTANCE FROM WALL (FT)	DENSITY, RHO (LB/CU FT)	VISCOSITY, MU LB/SEC FT	RHO*MU /RHOE*MUE, C	SPECIFIC HEAT (BTU/LB R)	THERMAL COND (BTU /SEC FT R)	PRANDTL NUMBER	MODIFIED SCHMIDT NUMBER	MOLECULAR WEIGHT	RHOSQ*EPS /RHOE*MUE	MACH NUMBER
0.E+00	7.287E-01	6.441E-05	1.187E+00	3.240E-01	3.151E-05	6.956E-01	7.813E-01	2.835E+01	0.E+00	0.E+00
7.132E-04	7.272E-01	6.449E-05	1.186E+00	3.240E-01	3.154E-05	6.956E-01	7.813E-01	2.834E+01	0.E+00	0.E+00
1.449E-03	7.256E-01	6.456E-05	1.185E+00	3.240E-01	3.158E-05	6.955E-01	7.813E-01	2.833E+01	0.E+00	0.E+00
2.973E-03	7.233E-01	6.468E-05	1.183E+00	3.239E-01	3.163E-05	6.954E-01	7.813E-01	2.832E+01	0.E+00	0.E+00
6.471E-03	7.194E-01	6.487E-05	1.180E+00	3.238E-01	3.171E-05	6.953E-01	7.812E-01	2.829E+01	0.E+00	0.E+00
7.403E-03	7.183E-01	6.493E-05	1.179E+00	3.238E-01	3.173E-05	6.952E-01	7.812E-01	2.828E+01	0.E+00	0.E+00
1.116E-04	7.055E-01	6.556E-05	1.170E+00	3.233E-01	3.183E-05	6.948E-01	7.810E-01	2.821E+01	0.E+00	0.E+00
1.481E-04	6.901E-01	6.602E-05	1.158E+00	3.228E-01	3.189E-05	6.943E-01	7.808E-01	2.812E+01	0.E+00	0.E+00
3.872E-04	6.507E-01	7.115E-05	1.129E+00	3.252E-01	3.330E-05	6.931E-01	7.803E-01	2.794E+01	0.E+00	0.E+00
6.258E-04	5.704E-01	7.727E-05	1.075E+00	3.198E-01	3.573E-05	6.915E-01	6.990E-01	2.783E+01	0.E+00	0.E+00
1.551E-03	5.495E-01	7.463E-05	1.054E+00	3.182E-01	3.613E-05	6.924E-01	6.997E-01	2.749E+01	0.E+00	0.E+00
2.261E-03	5.471E-01	7.419E-05	1.043E+00	3.185E-01	3.591E-05	6.933E-01	7.006E-01	2.711E+01	0.E+00	0.E+00
4.736E-03	5.393E-01	7.721E-05	1.019E+00	3.188E-01	3.550E-05	6.933E-01	7.004E-01	2.627E+01	0.E+00	0.E+00
7.723E-03	5.346E-01	7.670E-05	1.001E+00	3.187E-01	3.535E-05	6.922E-01	6.993E-01	2.588E+01	0.E+00	0.E+00
1.222E-04	5.342E-01	7.675E-05	1.000E+00	3.187E-01	3.534E-05	6.921E-01	6.992E-01	2.585E+01	0.E+00	0.E+00

DISTANCE FROM WALL,FT

0.E+00 7.332E-08 1.468E-07 2.573E-07 4.423E-07 7.403E-07 1.116E-06 1.881E-06 3.872E-06 6.258E-06
1.551E-05 2.261E-05 4.736E-05 7.723E-05 1.222E-04

ELEMENTAL FRACTIONS AND THEIR FIRST AND SECOND DERIVATIVES WITH RESPECT TO ETA

H 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00
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0.E+00 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00

C 1.454E-01 1.455E-01 1.452E-01 1.447E-01 1.440E-01 1.428E-01 1.413E-01 1.382E-01 1.704E-01 1.540E-01
1.203E-01 1.027E-01 3.561E-02 2.307E-03 0.E+00
-6.562E-02-6.571E-02-6.579E-02-6.593E-02-6.615E-02-6.650E-02-6.695E-02-6.785E-02-7.013E-02-7.454E-02
-7.615E-02-7.406E-02-4.422E-02-4.693E-03 0.E+00
-1.979E-02-1.982E-02-1.986E-02-1.992E-02-1.991E-02-1.963E-02-1.981E-02-2.015E-02-1.943E-02-4.720E-03
6.151E-03 2.629E-02 2.902E-02 5.872E-03-1.278E-03

NA 1.454E-07 1.455E-07 1.452E-07 1.447E-07 1.440E-07 1.428E-07 1.413E-07 1.382E-07 1.704E-07 1.540E-07
1.203E-07 1.027E-07 3.561E-08 2.307E-09 0.E+00
-6.562E-09-6.571E-08-6.579E-08-6.593E-08-6.615E-08-6.650E-08-6.695E-08-6.785E-08-7.013E-08-7.454E-08
-7.615E-08-7.406E-08-4.422E-08-4.693E-09 0.E+00
-1.979E-08-1.982E-08-1.986E-08-1.992E-08-1.991E-08-1.963E-08-1.981E-08-2.015E-08-1.943E-08-4.720E-09
6.151E-09 2.629E-08 2.902E-08 5.872E-09-1.278E-09

O2 1.913E-01 1.914E-01 1.915E-01 1.916E-01 1.918E-01 1.920E-01 1.924E-01 1.931E-01 1.950E-01 1.988E-01
2.040E-01 2.109E-01 2.266E-01 2.345E-01 2.350E-01
1.442E-02 1.444E-02 1.446E-02 1.449E-02 1.454E-02 1.463E-02 1.473E-02 1.494E-02 1.644E-02 1.752E-02
1.798E-02 1.746E-02 1.039E-02 1.103E-03 0.E+00
4.534E-03 4.541E-03 4.550E-03 4.563E-03 4.585E-03 4.613E-03 4.695E-03 4.735E-03 4.566E-03 1.109E-03
-1.445E-03-6.179E-03-6.020E-03-1.380E-03 3.094E-04

N2 4.229E-01 4.231E-01 4.233E-01 4.237E-01 4.243E-01 4.252E-01 4.263E-01 4.287E-01 4.347E-01 4.472E-01
4.649E-01 4.864E-01 7.378E-01 7.632E-01 7.650E-01
5.121E-02 5.127E-02 5.133E-02 5.143E-02 5.060E-02 5.047E-02 5.121E-02 5.190E-02 5.365E-02 5.703E-02
5.126E-02 5.665E-02 3.382E-02 1.599E-03 0.E+00
1.474E-02 1.471E-02 1.481E-02 1.485E-02 1.492E-02 1.502E-02 1.515E-02 1.542E-02 1.486E-02 3.611E-03
-4.786E-03-7.011E-02-2.228E-02-4.492E-03 9.778E-04

MOLE FRACTIONS

H 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00 0.E+00
0.E+00 0.E+00 0.E+00 0.E+00 0.E+00

C	2.837E-03	2.885E-03	2.932E-03	3.005E-03	3.123E-03	3.334E-03	3.6[illegible]E-03	4.161E-03	5.558E-03	3.409E-03
	1.481E-04	4.513E-05	4.619E-06	2.092E-07	0.E+00					
NA	7.910E-09	7.758E-09	7.607E-09	7.386E-09	7.026E-09	6.483E-09	5.863E-09	4.841E-09	3.440E-09	3.391E-09
	1.179E-08	1.332E-08	6.518E-09	4.570E-10	0.E+00					
O2	1.293E-10	1.357E-10	1.425E-10	1.533E-10	1.734E-10	2.122E-10	2.753E-10	4.782E-10	2.520E-09	1.028E-06
	9.791E-04	4.525E-03	2.429E-02	3.833E-02	3.938E-02					
N2	5.994E-01	5.997E-01	5.999E-01	6.003E-01	6.010E-01	6.020E-01	6.033E-01	6.060E-01	6.136E-01	6.349E-01
	6.414E-01	6.425E-01	6.487E-01	6.529E-01	6.532E-01					
E-	2.056E-07	2.067E-07	2.079E-07	2.097E-07	2.127E-07	2.181E-07	2.259E-07	2.479E-07	3.876E-07	2.365E-06
	1.462E-05	1.927E-05	2.420E-05	2.545E-05	2.553E-05					
CH	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
CHN	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
CHNO	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
CHO	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
CH2	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
CH2O	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
CH4	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
CN	2.849E-02	2.860E-02	2.872E-02	2.890E-02	2.917E-02	2.958E-02	3.001E-02	3.057E-02	2.921E-02	8.563E-03
	3.260E-04	1.048E-04	1.187E-05	5.565E-07	0.E+00					
CNNA	2.300E-08	2.215E-08	2.132E-08	2.013E-08	1.827E-08	1.550E-08	1.275E-08	8.481E-09	3.081E-09	2.154E-10
	2.188E-11	8.814E-12	5.876E-13	2.049E-15	0.E+00					
CO	3.390E-01	3.390E-01	3.390E-01	3.391E-01	3.391E-01	3.391E-01	3.392E-01	3.394E-01	3.404E-01	3.441E-01
	2.911E-01	2.279E-01	7.468E-02	4.712E-03	0.E+00					
CO2	4.350E-06	4.400E-06	4.451E-06	4.529E-06	4.665E-06	4.902E-06	5.233E-06	6.050E-06	9.831E-06	9.280E-05
	2.106E-03	3.743E-03	3.135E-03	2.565E-04	0.E+00					
C2	4.625E-03	4.642E-03	4.659E-03	4.682E-03	4.715E-03	4.754E-03	4.775E-03	4.711E-03	3.755E-03	2.327E-04
	3.155E-07	3.330E-08	4.401E-10	9.727E-13	0.E+00					
C2H	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00				
C2H2	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
C2H4	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
C2N2	1.645E-02	1.613E-02	1.581E-02	1.534E-02	1.457E-02	1.336E-02	1.191E-02	9.227E-03	3.876E-03	5.820E-05
	6.117E-08	7.166E-09	1.151E-10	2.718E-13	0.E+00					
C3	8.668E-03	8.526E-03	8.384E-03	8.1[illegible]E-03	7.811E-03	7.232E-03	6.506E-03	5.070E-03	1.964E-03	7.752E-06
	3.013E-10	1.138E-11	2.061E-14	2.266E-18	0.E+00					
HN	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00				
HNA	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
HNAO	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00				
HNO	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00				
HO	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00				
H2	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00				
H2N	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00				
H2N2	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00				

H2O	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00				
H3N	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
H4N2	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00				
NAO	9.708E-14	9.725E-14	9.742E-14	9.767E-14	9.812E-14	9.895E-14	1.004E-13	1.060E-13	1.589E-13	2.580E-12
	2.657E-10	6.560E-10	7.051E-10	6.799E-11	0.E+00					
NA2	3.419E-19	3.290E-19	3.165E-19	2.985E-19	2.705E-19	2.306E-19	1.890E-19	1.294E-19	6.581E-20	6.353E-20
	7.627E-19	9.772E-19	2.349E-19	1.156E-21	0.E+00					
N	4.693E-04	4.805E-04	4.920E-04	5.098E-04	5.409E-04	5.950E-04	6.710E-04	8.567E-04	1.640E-03	7.063E-03
	9.254E-03	8.357E-03	6.972E-03	6.590E-03	6.567E-03					
NO	3.415E-06	3.514E-06	3.616E-06	3.776E-06	4.061E-06	4.573E-06	5.327E-06	7.350E-06	1.904E-05	5.043E-04
	1.638E-02	3.463E-02	7.804E-02	9.733E-02	9.862E-02					
NO2	2.592E-13	2.725E-13	2.865E-13	3.090E-13	3.511E-13	4.325E-13	5.659E-13	1.000E-12	5.514E-12	2.488E-09
	2.417E-06	1.112E-05	5.936E-05	9.364E-05	9.622E-05					
NO3	6.443E-22	6.957E-22	7.515E-22	8.445E-22	1.028E-21	1.417E-21	2.142E-21	5.138E-21	7.035E-20	7.681E-16
	2.381E-11	2.324E-10	2.808E-09	5.522E-09	5.749E-09					
N2O	2.046E-09	2.117E-09	2.170E-09	2.268E-09	2.444E-09	2.760E-09	3.227E-09	4.485E-09	1.188E-08	3.340E-07
	1.101E-05	2.320E-05	5.221E-05	6.519E-05	6.696E-05					
N2O3	5.485E-23	5.929E-23	6.411E-23	7.216E-23	8.807E-23	1.219E-22	1.853E-22	4.496E-22	6.345E-21	7.455E-17
	2.348E-12	2.284E-11	2.752E-10	5.417E-10	5.640E-10					
N2O4	4.538E-31	5.015E-31	5.545E-31	6.455E-31	8.339E-31	1.267E-30	2.172E-30	6.812E-30	2.099E-28	4.499E-23
	4.300E-17	9.052E-16	2.557E-14	6.347E-14	6.700E-14					
N2O5	1.167E-37	1.321E-37	1.496E-37	1.907E-37	2.483E-37	4.173E-37	8.149E-37	3.369E-36	2.380E-34	1.022E-27
	3.008E-20	1.363E-18	8.936E-17	2.787E-16	2.982E-16					
O	2.942E-06	3.052E-06	3.162E-06	3.345E-06	3.671E-06	4.269E-06	5.178E-06	7.758E-06	2.502E-05	1.080E-03
	3.831E-02	7.805E-02	1.640E-01	1.997E-01	2.020E-01					
O+1	7.998E-09	8.538E-09	9.155E-09	1.013E-08	1.199E-08	1.566E-08	2.178E-08	4.128E-08	1.680E-07	5.671E-07
	7.615E-09	1.369E-09	7.088E-11	2.639E-12	0.E+00					
NA+	1.982E-07	1.987E-07	1.993E-07	2.000E-07	2.011E-07	2.025E-07	2.038E-07	2.046E-07	2.005E-07	1.828E-07
	1.413E-07	1.071E-07	3.338E-08	2.071E-09	0.E+00					
NO+	5.190E-10	5.568E-10	5.974E-10	6.641E-10	7.928E-10	1.054E-09	1.508E-09	3.097E-09	1.893E-08	1.561E-06
	1.412E-05	1.834E-05	2.249E-05	2.360E-05	2.366E-05					
O-	3.228E-12	3.329E-12	3.433E-12	3.597E-12	3.893E-12	4.433E-12	5.257E-12	7.679E-12	2.816E-11	3.543E-09
	6.749E-07	1.914E-06	5.572E-06	7.362E-06	7.484E-06					
C-	1.176E-09	1.189E-09	1.203E-09	1.225E-09	1.261E-09	1.320E-09	1.401E-09	1.594E-09	2.486E-09	4.718E-09
	1.113E-09	4.702E-10	6.615E-11	3.244E-12	0.E+00					
H+1	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
HO-1	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
H3O+1	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00
	0.E+00	0.E+00	0.E+00	0.E+00	0.E+00					
N+1	9.076E-13	9.930E-13	1.086E-12	1.243E-12	1.558E-12	2.234E-12	3.507E-12	8.591E-12	7.612E-11	4.593E-09
	2.208E-09	1.101E-09	4.119E-10	3.079E-10	3.025E-10					
NO2-	2.718E-16	2.818E-16	2.902E-16	3.050E-16	3.319E-16	3.819E-16	4.603E-16	7.032E-16	3.202E-15	2.060E-12
	9.432E-09	6.354E-08	5.151E-07	9.083E-07	9.394E-07					
N2+1	7.752E-11	8.333E-11	8.959E-11	9.988E-11	1.197E-10	1.600E-10	2.298E-10	4.699E-10	2.582E-09	5.405E-08
	2.247E-08	1.156E-08	4.986E-09	3.908E-09	3.851E-09					
O+1	1.248E-14	1.378E-14	1.520E-14	1.764E-14	2.260E-14	3.369E-14	5.565E-14	1.530E-13	2.032E-12	9.479E-10
	1.176E-08	1.348E-08	1.313E-08	1.278E-08	1.275E-08					
O2+1	1.605E-14	1.761E-14	1.933E-14	2.224E-14	2.815E-14	4.118E-14	6.664E-14	1.778E-13	2.400E-12	3.652E-09
	1.001E-06	2.808E-06	8.014E-06	1.056E-05	1.073E-05					
O2-	2.682E-17	2.811E-17	2.948E-17	3.167E-17	3.576E-17	4.367E-17	5.670E-17	1.008E-16	6.861E-16	1.080E-12
	5.815E-09	3.668E-08	2.633E-07	4.456E-07	4.597E-07					

CASE 2 - - - - - - - - - - - STREAMWISE DIMENSION 0.42310E+01 FEET - - - -

ITERATED VALUES ITS	TIME	ALPH	FPPW	DAMP ERROR	MAX.LIN MOMENTUM	MAX.ERRORS IN CONSERVATION EQS. ENERGY	H	C	NA	O2	
1	8.36232.173	7.88400.4999		5E-02 18	4.1E+01 13	1.8E+03 13-4.8E-03		13-1.8E-01	13-2.0E-07 15	5.2E-02	0
2	17.28232.707	8.07551.0003		3E-02 18	1.8E+01 13	8.8E+02 13-2.4E-03		13-9.1E-02	13-1.0E-07 15	2.0E-02	0
3	26.08632.744	8.07401.0000		3E-02 18	4.1E+00 15	1.6E+02 15 6.6E-05		15 2.1E-03	15 2.3E-09 15	7.4E-03	0
4	34.18832.737	8.07381.0000		5E-03 18	1.4E+00 15	2.4E+01 15	1.4E-06	15-6.4E-05	15-6.9E-11 15	1.7E-03	0
5	42.18132.735	8.07381.0000		5E-04 18	2.1E-01 15	1.5E+00 3	1.9E-07	3-8.4E-06	3-9.1E-12 15	1.8E-04	0
6	50.12032.735	8.07381.00 0		5E-05 18	6.4E-03 15	3.8E-01 3	5.0E-08	3-2.2E-06	3-2.4E-12 15	8.2E-06	0
7	57.53832.735	8.07381.0000		2E-05 18	3.9E-03 15	1.2E-01 11	1.1E-07	11-5.1E-06	11-5.5E-12 15	6.3E-06	0
8	64.95732.735	8.07381.0000		4E-06 18	1.0E-03 15	1.6E-02 10	8.5E-09	10 3.8E-07	10 4.1E-13 15	1.2E-06	0
9	72.37532.735	8.07381.0000		2E-07 18	1.2E-04 11	1.4E-03 11	2.6E-09	11 1.2E-07	11 1.3E-13 15	9.3E-08	0

ALPHA	XI (LB /SEC)**2	ROKAP (FT)	PRESSURE (ATM)	EDGE VELOCITY (FT/SEC)	BETA	FLUX NORMALIZING PARAMETER	DIFFUSIONAL HEAT FLUXES TOT ENTH (BTU/SEC SQ FT)	RERAD	QCOND
3.273E+01	8.432E-03	6.218E-01	4.161E+00	1.010E+04	1.960E-03	7.106E-02	1.081E+03	9.186E+02	0.E+00	1.253E+03

WALL SHEAR (LB/SQ FT)	MECH REM	MASS FLUXES PYROL GAS (LB/SEC SQ FT)	CHAR	TOTAL GAS	ELEMENTAL MASS DIFFUSIVE FLUXES (LB/SEC SQ FT) FOR HYDROGEN	CARBON	NITROGEN	OXYGEN	SODIUM
1.713E+02	0.E+00	0.E+00	1.160E-01	1.160E-01	-1.970E-03	-8.694E-02	7.201E-02	1.690E-02	-9.414E-08

MOM TRANS COEFF, RHO*UE*CF/2	HEAT TRANS COEFF, RHO*UE*CH	BLOWING PARAMETERS (BASED ON CH) FOR PYROL GAS	CHAR	TOTAL GAS	ELEMENTAL MASS TRANSFER COEFFICIENTS, RHOE*UE*CM (LB/SEC SQ FT) FOR HYDROGEN	CARBON	NITROGEN	OXYGEN	SODIUM
5.457E-01	4.309E-01	0.E+00	2.692E-01	2.692E-01	5.021E-01	4.990E-01	4.992E-01	4.983E-01	4.992E-01

MOMENTUM THICKNESS, THETA (FT)	DISPLACE. THICKNESS, DELSTAR (FT)	EFFECTIVE BODY DISPLACE. (FT)	ENTHALPY THICKNESS, LAMBDA (FT)	REYNOLDS NUMBER PER FOOT	MASS THICKNESSES (FT) FOR HYDROGEN	CARBON	NITROGEN	OXYGEN	SODIUM
-2.224E-02	-5.340E-02	-5.249E-02	4.698E-03	4.963E+06	4.642E-03	4.851E-03	4.835E-03	4.894E-03	4.835E-03

NODAL INFORMATION

DISTANCE, FROM WALL (FT)	ETA	F	FP (=U/UE)	FPP	SHEAR (LB/FTSQ)	TOTAL ENTHALPY,G (BTU/LB)	CP (BTU/LB)	GPP (BTU/LB)	STATIC ENTHALPY (BTU/LB)	TEMP (DEG R)	ELECTRON COLL FREQ (1/SEC)
0.E+00	0.E+00	-1.189E+00	0.E+00	8.074E+00	1.713E+02	1.395E+03	0.901E+03	-4.340E+04	1.395E+03	6.076E+03	4.164E+11
5.954E-05	6.547E-02	-1.174E+00	3.874E-01	3.762E+00	1.853E+02	1.951E+03	7.000E+03	-6.406E+04	1.645E+03	6.753E+03	3.949E+11
1.194E-04	1.309E-01	-1.143E+00	5.577E-01	1.439E+00	1.915E+02	2.275E+03	2.866E+03	-1.535E+04	1.642E+03	6.698E+03	3.992E+11
2.057E-04	2.291E-01	-1.082E+00	6.612E-01	6.685E-01	1.951E+02	2.483E+03	1.359E+03	-4.011E+03	1.593E+03	6.460E+03	4.036E+11
3.445E-04	3.928E-01	-9.665E-01	7.438E-01	3.406E-01	1.978E+02	2.652E+03	7.021E+02	-1.179E+03	1.525E+03	6.309E+03	4.086E+11
5.985E-04	6.547E-01	-7.618E-01	8.130E-01	1.836E-01	1.999E+02	2.795E+03	3.934E+02	-4.288E+02	1.449E+03	6.157E+03	4.136E+11
8.174E-04	9.820E-01	-4.867E-01	8.636E-01	1.203E-01	2.012E+02	2.901E+03	2.530E+02	-1.625E+02	1.382E+03	6.030E+03	4.179E+11
1.316E-03	1.637E+00	1.003E-01	9.256E-01	6.908E-02	2.023E+02	3.032E+03	1.466E+02	-4.686E+01	1.287E+03	5.847E+03	4.244E+11
2.492E-03	3.277E+00	1.692E+00	1.009E+00	3.270E-02	2.029E+02	3.209E+03	6.991E+01	-1.088E+01	1.136E+03	5.535E+03	4.362E+11
4.657E-03	6.547E+00	5.140E+00	1.089E+00	1.612E-02	1.977E+02	3.379E+03	3.431E+01	-1.978E+00	9.652E+02	5.098E+03	4.545E+11
7.571E-03	1.146E+01	1.066E+01	1.157E+00	1.178E-02	1.877E+02	3.524E+03	2.459E+01	-1.632E+00	7.965E+02	4.492E+03	4.842E+11
1.010E-02	1.637E+01	1.647E+01	1.206E+00	8.157E-03	1.742E+02	3.625E+03	1.658E+01	-7.419E-01	6.619E+02	3.868E+03	5.218E+11
1.630E-02	3.273E+01	3.795E+01	1.293E+00	2.475E-03	1.269E+02	3.797E+03	4.437E+00	-1.496E-01	3.910E+02	2.474E+03	6.525E+11
2.159E-02	5.238E+01	6.234E+01	1.327E+00	9.828E-04	9.072E+01	3.855E+03	1.498E+00	1.280E-01	2.681E+02	1.836E+03	7.573E+11
2.594E-02	8.184E+01	1.026E+02	1.366E+00	8.757E-05	1.303E+01	3.903E+03	0.E+00	-2.297E-01	1.054E+02	8.896E+02	1.088E+12

DISTANCE FROM WALL (FT)	DENSITY, RHO (LB/CU FT)	VISCOSITY, MU LB/SEC FT	RHO*MU /RHOE*MUE, C	SPECIFIC HEAT (BTU/LB R)	THERMAL COND (BTU /SEC FT R)	PRANDTL NUMBER	MODIFIED SCHMIDT NUMBER	MOLECULAR WEIGHT	RHOSQ*EPS /RHOE*MUE	MACH NUMBER
0.E+00	2.509E-02	5.572E-05	9.512E-01	3.396E-01	3.003E-05	6.305E-01	7.010E-01	2.676E+01	0.E+00	0.E+00
5.964E-05	2.224E-02	5.965E-05	9.028E-01	3.335E-01	3.210E-05	6.196E-01	7.002E-01	2.637E+01	1.306E+00	1.960E+00
1.194E-04	2.308E-02	5.885E-05	9.243E-01	3.306E-01	3.037E-05	6.406E-01	7.006E-01	2.677E+01	5.041E+00	1.479E+00
2.057E-04	2.392E-02	5.739E-05	9.441E-01	3.288E-01	2.916E-05	6.534E-01	7.006E-01	2.713E+01	1.214E+01	1.792E+00
3.445E-04	2.481E-02	5.710E-05	9.641E-01	3.268E-01	2.814E-05	6.631E-01	7.005E-01	2.748E+01	2.508E+01	2.059E+00
5.585E-04	2.574E-02	5.618E-05	9.839E-01	3.252E-01	2.725E-05	6.705E-01	7.002E-01	2.782E+01	4.656E+01	2.297E+00
8.174E-04	2.653E-02	5.540E-05	1.000E+00	3.240E-01	2.658E-05	6.753E-01	6.999E-01	2.808E+01	7.402E+01	2.480E+00
1.316E-03	2.770E-02	5.427E-05	1.023E+00	3.223E-01	2.570E-05	6.803E-01	6.994E-01	2.843E+01	1.303E+02	2.718E+00
2.492E-03	2.975E-02	5.229E-05	1.059E+00	3.193E-01	2.436E-05	6.854E-01	6.986E-01	2.891E+01	2.759E+02	3.067E+00
4.657E-03	3.274E-02	4.947E-05	1.102E+00	3.176E-01	2.281E-05	6.882E-01	6.975E-01	2.930E+01	5.490E+02	3.448E+00
7.571E-03	3.731E-02	4.545E-05	1.154E+00	3.127E-01	2.064E-05	6.886E-01	6.965E-01	2.942E+01	7.131E+02	3.845E+00
1.010E-02	4.321E-02	4.113E-05	1.210E+00	3.074E-01	1.838E-05	6.880E-01	6.957E-01	2.934E+01	9.565E+02	4.247E+00
1.636E-02	6.695E-02	3.059E-05	1.393E+00	2.902E-01	1.293E-05	6.865E-01	6.946E-01	2.907E+01	2.296E+03	5.559E+00
2.155E-02	8.987E-02	2.512E-05	1.536E+00	2.741E-01	1.004E-05	6.860E-01	6.943E-01	2.897E+01	4.137E+03	6.538E+00
2.644E-02	1.848E-01	1.557E-05	1.958E+00	1.775E-01	4.035E-06	6.852E-01	6.940E-01	2.886E+01	6.654E+03	8.715E+00

DISTANCE FROM WALL,FT

0.E+00 5.964E-05 1.194E-04 2.057E-04 3.445E-04 5.585E-04 8.174E-04 1.316E-03 2.492E-03 4.657E-03
7.571E-03 1.010E-02 1.636E-02 2.155E-02 2.644E-02

ELEMENTAL FRACTIONS AND THEIR FIRST AND SECOND DERIVATIVES WITH RESPECT TO ETA

H
3.923E-03 2.904E-03 2.410E-03 2.095E-03 1.839E-03 1.623E-03 1.466E-03 1.273E-03 1.014E-03 7.683E-04
5.618E-04 4.181E-04 1.732E-04 8.963E-05 0.E+00
-2.043E-02-1.072E-02-4.358E-03-2.065E-03-1.059E-03-5.879E-04-3.750E-04-2.149E-04-1.011E-04-4.910E-05
-3.499E-05-2.356E-05-6.366E-06-2.143E-06 0.E+00
1.484E-01 9.712E-02 2.335E-02 6.141E-03 1.801E-03 6.505E-04 2.444E-04 6.955E-05 1.588E-05 2.874E-06
2.328E-06 1.056E-06 2.151E-07 7.287E-07 4.741E-07

C
1.742E-01 1.292E-01 1.075E-01 9.354E-02 8.225E-02 7.273E-02 6.577E-02 5.724E-02 4.580E-02 3.492E-02
2.573E-02 1.931E-02 8.272E-03 4.398E-03 0.E+00
-9.017E-01-4.730E-01-1.923E-01-9.114E-02-4.677E-02-2.596E-02-1.656E-02-9.497E-03-4.473E-03-2.179E-03
-1.561E-03-1.056E-03-2.923E-04-1.021E-04 0.E+00
6.548E+00 4.287E+00 1.031E+00 2.711E-01 7.949E-02 2.871E-02 1.079E-02 3.070E-03 7.007E-04 1.260E-04
1.027E-04 4.669E-05 9.684E-06-1.654E-05 2.347E-05

NA
1.886E-07 1.398E-07 1.163E-07 1.012E-07 8.897E-08 7.866E-08 7.112E-08 6.189E-08 4.951E-08 3.772E-08
2.779E-08 2.084E-08 8.904E-09 4.726E-09 0.E+00
-9.764E-07-5.122E-07-2.083E-07-9.869E-08-5.065E-08-2.811E-08-1.793E-08-1.028E-08-4.843E-09-2.359E-09
-1.689E-09-1.143E-09-3.156E-10-1.099E-10 0.E+00
7.091E-06 4.642E-06 1.116E-06 2.935E-07 8.607E-08 3.109E-08 1.168E-08 3.324E-09 7.588E-10 1.365E-10
1.112E-10 5.053E-11 1.047E-11-1.774E-11 2.520E-11

O2
2.011E-01 2.098E-01 2.141E-01 2.168E-01 2.190E-01 2.208E-01 2.222E-01 2.238E-01 2.261E-01 2.282E-01
2.300E-01 2.312E-01 2.334E-01 2.341E-01 2.350E-01
1.753E-01 9.195E-02 3.739E-02 1.772E-02 9.093E-03 5.043E-03 3.219E-03 1.847E-03 8.699E-04 4.241E-04
3.040E-04 2.060E-04 5.728E-05 2.015E-05 0.E+00
-1.273E+00-8.333E-01-2.003E-01-5.269E-02-1.545E-02-5.581E-03-2.097E-03-5.967E-04-1.362E-04-2.445E-05
-1.996E-05-9.089E-06-1.890E-06 3.297E-06-4.665E-06

N2
6.208E-01 6.599E-01 6.761E-01 6.876E-01 6.969E-01 7.048E-01 7.106E-01 7.177E-01 7.271E-01 7.361E-01
7.437E-01 7.491E-01 7.542E-01 7.614E-01 7.650E-01
7.469E-01 3.918E-01 1.593E-01 7.549E-02 3.874E-02 2.150E-02 1.372E-02 7.866E-03 3.704E-03 1.804E-03
1.292E-03 8.740E-04 2.414E-04 8.419E-05 0.E+00
-5.424E+00-3.551E+00-9.536E-01-2.245E-01-6.584E-02-2.378E-02-8.936E-03-2.543E-03-5.804E-04-1.044E-04
-8.506E-05-3.865E-05-8.009E-06 1.357E-05-1.928E-05

MOLE FRACTIONS

H
2.842E-02 4.532E-02 3.153E-02 2.305E-02 1.677E-02 1.207E-02 9.053E-03 5.885E-03 2.648E-03 7.462E-04
8.827E-05 4.946E-06 4.777E-11 8.808E-16 0.E+00

C	2.152E-04	4.363E-08	9.998E-09	3.319E-09	1.160E-09	4.073E-10	1.662E-10	4.417E-11	3.825E-12	7.941E-14
	9.188E-17	1.087E-20	2.181E-36	2.340E-51	0.E+00					
NA	2.318E-08	5.896E-09	7.113E-09	7.704E-09	8.101E-09	8.391E-09	8.585E-09	8.817E-09	9.056E-09	8.563E-09
	6.677E-09	3.535E-09	9.135E-12	1.578E-14	0.E+00					
O2	4.664E-13	3.023E-03	1.147E-02	2.053E-02	3.041E-02	4.074E-02	4.955E-02	6.197E-02	8.206E-02	1.067E-01
	1.344E-01	1.565E-01	1.904E-01	2.007E-01	2.119E-01					
N2	5.738E-01	6.137E-01	6.359E-01	6.530E-01	6.689E-01	6.839E-01	6.958E-01	7.114E-01	7.339E-01	7.557E-01
	7.716E-01	7.794E-01	7.864E-01	7.874E-01	7.881E-01					
E-	1.847E-07	4.178E-07	4.094E-07	3.336E-07	2.547E-07	1.868E-07	1.403E-07	8.991E-08	3.761E-08	7.941E-09
	4.429E-10	7.901E-12	2.087E-19	1.152E-26	0.E+00					
CH	1.449E-05	1.289E-09	2.644E-10	8.430E-11	2.866E-11	9.828E-12	3.933E-12	1.017E-12	8.411E-14	1.558E-15
	1.739E-18	1.834E-22	2.388E-38	1.859E-53	0.E+00					
CHN	3.304E-02	5.094E-07	1.744E-07	7.904E-08	3.903E-08	1.979E-08	1.118E-08	4.847E-09	1.048E-09	9.037E-11
	1.387E-12	5.181E-15	1.426E-24	1.444E-33	0.E+00					
CHNO	7.193E-08	4.315E-08	2.873E-08	2.111E-08	1.130E-08	8.497E-09	5.470E-09	2.308E-09	5.281E-10	
	3.830E-11	1.080E-12	8.598E-19	1.730E-24	0.E+00					
CHO	1.419E-05	1.136E-05	6.978E-06	4.728E-06	3.201E-06	2.132E-06	1.485E-06	8.532E-07	2.922E-07	4.818E-08
	2.008E-09	2.659E-11	9.053E-19	8.093E-26	0.E+00					
CH2	6.714E-07	2.087E-11	4.013E-12	1.288E-12	4.482E-13	1.584E-13	6.522E-14	1.765E-14	1.598E-15	3.475E-17
	5.248E-20	8.489E-24	7.138E-39	3.935E-53	0.E+00					
CH2O	1.352E-08	5.335E-09	2.870E-09	1.621E-09	1.168E-09	7.390E-10	4.931E-10	2.663E-10	8.178E-11	1.151E-11
	3.775E-13	3.689E-15	4.309E-23	1.655E-30	0.E+00					
CH4	3.651E-08	1.019E-13	1.826E-14	6.345E-15	2.478E-15	1.000E-15	4.648E-16	1.516E-16	1.969E-17	7.877E-19
	3.555E-21	2.623E-24	1.308E-36	4.466E-48	0.E+00					
CN	3.289E-03	2.695E-07	7.553E-08	3.098E-08	1.354E-08	6.004E-09	3.016E-09	1.086E-09	1.660E-10	8.073E-12
	4.538E-14	4.247E-17	3.599E-29	1.137E-40	0.E+00					
CNNA	1.153E-08	4.563E-14	2.136E-14	1.348E-14	8.997E-15	6.119E-15	4.430E-15	2.765E-15	1.146E-15	2.499E-16
	1.560E-17	2.851E-19	1.475E-27	1.153E-35	0.E+00					
CO	3.363E-01	2.731E-01	2.195E-01	1.837E-01	1.534E-01	1.267E-01	1.065E-01	8.098E-02	4.656E-02	1.739E-02
	2.858E-03	2.410E-04	1.380E-08	1.366E-12	0.E+00					
CO2	4.256E-07	1.061E-02	2.005E-02	2.753E-02	3.475E-02	4.173E-02	4.731E-02	5.451E-02	6.368E-02	6.777E-02
	6.018E-02	4.693E-02	2.002E-02	1.061E-02	0.E+00					
C2	1.326E-04	6.210E-13	4.988E-14	8.696E-15	1.731E-15	3.567E-16	9.334E-17	1.303E-17	3.480E-19	1.038E-21
	4.971E-26	7.737E-32	5.842E-55	5.718E-77	0.E+00					
C2H	4.498E-03	4.337E-12	3.520E-13	7.109E-14	1.631E-14	3.925E-15	1.180E-15	2.033E-16	8.093E-18	4.645E-20
	6.977E-24	5.201E-29	2.560E-49	1.508E-68	0.E+00					
C2H2	1.609E-03	4.457E-13	3.619E-14	7.456E-15	1.830E-15	4.755E-16	1.533E-16	2.943E-17	1.444E-18	1.182E-20
	3.370E-24	6.167E-29	1.414E-47	4.129E-65	0.E+00					
C2H4	9.261E-09	6.564E-19	4.046E-20	7.236E-21	1.576E-21	3.650E-22	1.058E-22	1.778E-23	6.761E-25	3.778E-27
	5.902E-31	4.892E-36	5.521E-56	1.182E-74	0.E+00					
C2N2	8.900E-04	7.425E-13	8.775E-14	2.293E-14	6.996E-15	2.253E-15	8.721E-16	2.187E-16	1.731E-17	2.904E-19
	2.610E-22	2.182E-26	1.963E-42	1.409E-57	0.E+00					
C3	3.492E-04	2.182E-17	6.845E-19	7.038E-20	9.026E-21	1.242E-21	2.338E-22	2.035E-23	2.310E-25	1.744E-28
	7.923E-34	5.395E-41	2.172E-69	2.453E-96	0.E+00					
HN	8.301E-06	1.963E-05	1.296E-05	8.894E-06	6.041E-06	4.037E-06	2.832E-06	1.662E-06	6.142E-07	1.247E-07
	8.281E-09	2.084E-10	7.218E-17	5.015E-23	0.E+00					
HNA	7.231E-11	1.371E-11	1.336E-11	1.242E-11	1.127E-11	1.006E-11	9.043E-12	7.661E-12	5.523E-12	3.000E-12
	9.302E-13	1.422E-13	2.598E-18	4.481E-23	0.E+00					
HNAO	8.760E-15	3.839E-11	9.304E-11	1.507E-10	2.204E-10	3.056E-10	3.928E-10	5.496E-10	9.433E-10	1.872E-09
	4.722E-09	1.136E-08	1.116E-08	5.954E-09	0.E+00					
HNO	1.214E-11	9.971E-07	1.511E-06	1.658E-06	1.656E-06	1.563E-06	1.440E-06	1.230E-06	8.549E-07	4.354E-07
	1.243E-07	2.092E-08	1.314E-11	1.168E-14	0.E+00					
HO	1.264E-07	3.033E-03	1.250E-02	1.418E-02	1.471E-02	1.447E-02	1.385E-02	1.253E-02	9.761E-03	6.023E-03
	2.417E-03	6.487E-04	2.655E-06	1.396E-08	0.E+00					
H2	1.746E-02	8.530E-03	5.705E-03	4.320E-03	3.314E-03	2.535E-03	2.009E-03	1.422E-03	7.538E-04	2.796E-04
	5.384E-05	5.857E-06	8.396E-10	2.204E-13	0.E+00					
H2N	9.221E-07	4.673E-07	2.845E-07	1.935E-07	1.321E-07	8.926E-08	6.333E-08	3.786E-08	1.458E-08	3.261E-09
	2.477E-10	7.738E-12	6.468E-19	1.153E-23	0.E+00					
H2N2	2.349E-11	2.669E-11	1.588E-11	1.047E-11	6.913E-12	4.502E-12	3.090E-12	1.755E-12	6.117E-13	1.138E-13
	6.615E-15	1.408E-16	2.848E-23	1.414E-29	0.E+00					

H2O	1.730E-07	2.747E-03	4.275E-03	5.246E-03	6.007E-03	6.590E-03	6.958E-03	7.317E-03	7.582E-03	7.499E-03
	6.893E-03	5.752E-03	2.496E-03	1.288E-03	0.E+00					
H3N	4.048E-08	1.205E-08	6.933E-09	4.797E-09	3.391E-09	2.390E-09	1.764E-09	1.123E-09	4.899E-10	1.332E-10
	1.537E-11	8.405E-13	7.892E-18	1.671E-22	0.E+00					
H4N2	1.811E-16	7.097E-17	3.121E-17	1.623E-17	8.890E-18	4.812E-18	2.819E-18	1.268E-18	2.894E-19	2.823E-20
	5.781E-22	3.096E-24	2.979E-33	1.219E-41	0.E+00					
NAO	4.864E-15	7.794E-11	1.906E-10	2.884E-10	3.864E-10	4.859E-10	5.719E-10	6.997E-10	9.302E-10	1.210E-09
	1.453E-09	1.269E-09	1.961E-11	1.750E-13	0.E+00					
NA2	7.429E-20	5.000E-21	7.219E-21	8.399E-21	9.205E-21	9.784E-21	1.016E-20	1.059E-20	1.093E-20	9.446E-21
	5.412E-21	1.396E-21	6.453E-27	1.332E-32	0.E+00					
N	4.425E-05	2.577E-04	1.869E-04	1.315E-04	9.023E-05	6.066E-05	4.270E-05	2.513E-05	9.303E-06	1.571E-06
	1.199E-07	2.865E-09	7.821E-16	3.982E-22	5.499E-48					
NO	9.423E-08	1.079E-02	2.010E-02	2.548E-02	2.922E-02	3.171E-02	3.300E-02	3.376E-02	3.272E-02	2.800E-02
	1.895E-02	1.018E-02	6.483E-04	4.270E-05	5.114E-10					
NO2	1.158E-16	8.732E-07	3.295E-06	5.933E-06	8.518E-06	1.122E-05	1.343E-05	1.636E-05	2.051E-05	2.418E-05
	2.532E-05	2.274E-05	9.645E-06	3.749E-06	6.458E-08					
NO3	1.783E-27	1.317E-12	9.311E-12	2.115E-11	3.598E-11	5.238E-11	6.641E-11	8.519E-11	1.100E-10	1.241E-10
	1.092E-10	7.235E-11	8.057E-12	8.885E-13	1.201E-16					
N2O	8.648E-12	1.045E-06	1.973E-06	2.523E-06	2.915E-06	3.185E-06	3.331E-06	3.429E-06	3.348E-06	2.883E-06
	1.960E-06	1.064E-06	7.732E-08	6.249E-09	2.273E-13					
N2O3	2.144E-29	1.736E-14	1.235E-13	2.807E-13	4.770E-13	6.927E-13	8.753E-13	1.115E-12	1.416E-12	1.540E-12
	1.257E-12	7.484E-13	5.408E-14	3.972E-15	1.109E-19					
N2O4	2.610E-39	1.434E-19	2.053E-18	6.471E-18	1.391E-17	2.435E-17	3.520E-17	5.305E-17	8.620E-17	1.277E-16
	1.607E-16	1.627E-16	9.756E-17	5.900E-17	1.454E-17					
N2O5	6.502E-48	2.942E-23	8.183E-22	3.442E-21	8.977E-21	1.813E-20	2.801E-20	4.832E-20	8.944E-20	1.484E-19
	2.026E-19	2.110E-19	1.166E-19	6.326E-20	1.235E-20					
O	1.183E-07	2.386E-02	3.882E-02	4.278E-02	4.236E-02	3.947E-02	3.595E-02	3.016E-02	2.028E-02	9.779E-03
	2.528E-03	3.729E-04	1.331E-07	6.243E-11	1.247E-24					
O+1	1.168E-12	6.617E-15	6.849E-16	1.161E-16	2.094E-17	3.770E-18	8.654E-19	9.840E-20	1.828E-21	3.615E-24
	1.134E-28	1.095E-34	3.323E-58	1.374E-80	0.E+00					
NA+	1.847E-07	1.543E-07	1.280E-07	1.112E-07	9.762E-08	8.598E-08	7.732E-08	6.646E-08	5.132E-08	3.642E-08
	2.271E-08	1.043E-08	6.802E-11	3.721E-13	0.E+00					
HO+	1.459E-13	2.318E-07	2.238E-07	1.680E-07	1.163E-07	7.633E-08	5.171E-08	2.818E-08	8.828E-09	1.464E-09
	7.853E-11	1.585E-12	7.381E-19	7.033E-25	0.E+00					
O-	2.145E-14	4.533E-09	8.421E-09	8.908E-09	8.006E-09	6.549E-09	5.245E-09	3.568E-09	1.548E-09	3.111E-10
	1.384E-11	1.590E-13	3.974E-22	1.586E-30	0.E+00					
C-	1.246E-11	2.841E-15	7.330E-16	2.301E-16	7.183E-17	2.178E-17	7.699E-18	1.623E-18	8.694E-20	6.681E-22
	1.247E-25	9.813E-31	7.241E-52	3.555E-72	0.E+00					
H+1	3.989E-14	3.937E-12	1.065E-12	3.357E-13	1.052E-13	3.212E-14	1.147E-14	2.479E-15	1.497E-16	1.993E-18
	1.681E-21	1.346E-25	1.675E-41	1.324E-56	0.E+00					
HO-1	2.996E-14	1.759E-09	3.202E-09	3.582E-09	3.470E-09	3.087E-09	2.667E-09	2.037E-09	1.102E-09	3.196E-10
	2.707E-11	7.469E-13	6.558E-21	8.580E-27	0.E+00					
H3O+1	1.428E-15	1.683E-10	1.170E-10	7.021E-11	5.028E-11	3.210E-11	2.013E-11	1.032E-11	2.953E-12	4.460E-13
	2.229E-14	4.255E-16	1.990E-22	2.728E-28	0.E+00					
N+1	1.118E-17	5.609E-15	1.474E-15	4.175E-16	1.148E-16	3.032E-17	9.497E-18	1.681E-18	6.909E-20	4.849E-22
	1.320E-25	2.234E-30	4.550E-49	6.408E-67	0.E+00					
NO2-	1.592E-19	5.279E-10	2.697E-09	5.503E-09	8.866E-09	1.259E-08	1.588E-08	2.060E-08	2.771E-08	3.081E-08
	2.240E-08	1.042E-08	6.802E-11	3.721E-13	0.E+00					
N2+1	3.686E-15	5.352E-13	1.754E-13	6.665E-14	2.501E-14	9.154E-15	3.818E-15	1.038E-15	9.481E-17	2.376E-18
	5.617E-21	1.775E-24	5.013E-38	5.955E-51	0.E+00					
O+1	1.400E-19	1.770E-12	1.110E-12	5.270E-13	2.245E-13	8.859E-14	3.837E-14	1.069E-14	9.615E-16	2.179E-17
	3.983E-20	8.300E-24	3.640E-38	6.994E-52	0.E+00					
O2+1	3.370E-19	3.844E-08	7.214E-08	7.274E-08	5.167E-08	4.723E-08	3.558E-08	2.199E-08	8.173E-09	1.640E-09
	1.106E-10	2.831E-12	2.854E-18	5.374E-24	0.E+00					
O2-	6.882E-21	6.669E-11	2.695E-10	4.296E-10	5.333E-10	5.767E-10	5.725E-10	5.191E-10	3.595E-10	1.391E-10
	1.689E-11	6.960E-13	2.413E-19	1.001E-25	0.E+00					